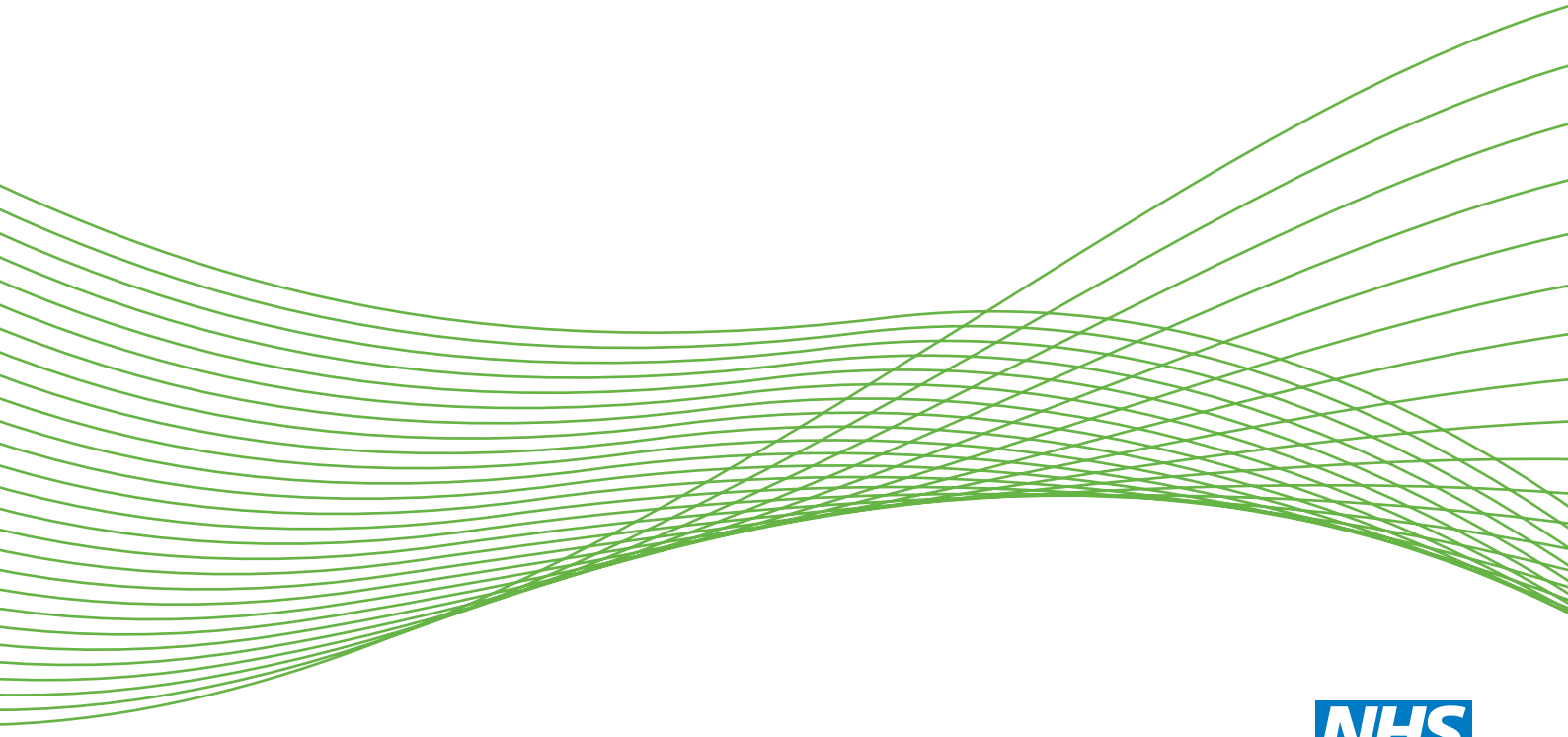
HEALTH SERVICES AND DELIVERY RESEARCH

VOLUME 3 ISSUE 24 MAY 2015
ISSN 2050-4349

What is the evidence on interventions to manage referral from primary to specialist non-emergency care? A systematic review and logic model synthesis

Lindsay Blank, Susan Baxter, Helen Buckley Woods, Elizabeth Goyder, Andrew Lee, Nick Payne and Melanie Rimmer



National Institute for Health Research

DOI 10.3310/hsdr03240

What is the evidence on interventions to manage referral from primary to specialist non-emergency care? A systematic review and logic model synthesis

Lindsay Blank,* Susan Baxter, Helen Buckley Woods, Elizabeth Goyder, Andrew Lee, Nick Payne and Melanie Rimmer

School of Health and Related Research (ScHARR), University of Sheffield, Sheffield, UK

*Corresponding author

Declared competing interests of authors: none

Published May 2015
DOI: 10.3310/hsdr03240

This report should be referenced as follows:

Blank L, Baxter S, Woods HB, Goyder E, Lee A, Payne N, *et al*. What is the evidence on interventions to manage referral from primary to specialist non-emergency care? A systematic review and logic model synthesis. *Health Serv Deliv Res* 2015;**3**(24).

Health Services and Delivery Research

ISSN 2050-4349 (Print)

ISSN 2050-4357 (Online)

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics (COPE) (www.publicationethics.org/).

Editorial contact: nihredit@southampton.ac.uk

The full HS&DR archive is freely available to view online at www.journalslibrary.nihr.ac.uk/hsdr. Print-on-demand copies can be purchased from the report pages of the NIHR Journals Library website: www.journalslibrary.nihr.ac.uk

Criteria for inclusion in the *Health Services and Delivery Research* journal

Reports are published in *Health Services and Delivery Research* (HS&DR) if (1) they have resulted from work for the HS&DR programme or programmes which preceded the HS&DR programme, and (2) they are of a sufficiently high scientific quality as assessed by the reviewers and editors.

HS&DR programme

The Health Services and Delivery Research (HS&DR) programme, part of the National Institute for Health Research (NIHR), was established to fund a broad range of research. It combines the strengths and contributions of two previous NIHR research programmes: the Health Services Research (HSR) programme and the Service Delivery and Organisation (SDO) programme, which were merged in January 2012.

The HS&DR programme aims to produce rigorous and relevant evidence on the quality, access and organisation of health services including costs and outcomes, as well as research on implementation. The programme will enhance the strategic focus on research that matters to the NHS and is keen to support ambitious evaluative research to improve health services.

For more information about the HS&DR programme please visit the website: http://www.nets.nihr.ac.uk/programmes/hsdr

This report

The research reported in this issue of the journal was funded by the HS&DR programme or one of its preceding programmes as project number 11/1022/01. The contractual start date was in November 2012. The final report began editorial review in February 2014 and was accepted for publication in October 2014. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HS&DR editors and production house have tried to ensure the accuracy of the authors' report and would like to thank the reviewers for their constructive comments on the final report document. However, they do not accept liability for damages or losses arising from material published in this report.

This report presents independent research funded by the National Institute for Health Research (NIHR). The views and opinions expressed by authors in this publication are those of the authors and do not necessarily reflect those of the NHS, the NIHR, NETSCC, the HS&DR programme or the Department of Health. If there are verbatim quotations included in this publication the views and opinions expressed by the interviewees are those of the interviewees and do not necessarily reflect those of the authors, those of the NHS, the NIHR, NETSCC, the HS&DR programme or the Department of Health.

Published by the NIHR Journals Library (www.journalslibrary.nihr.ac.uk), produced by Prepress Projects Ltd, Perth, Scotland (www.prepress-projects.co.uk).

Abstract

What is the evidence on interventions to manage referral from primary to specialist non-emergency care? A systematic review and logic model synthesis

Lindsay Blank,* Susan Baxter, Helen Buckley Woods, Elizabeth Goyder, Andrew Lee, Nick Payne and Melanie Rimmer

School of Health and Related Research (ScHARR), University of Sheffield, Sheffield, UK

*Corresponding author l.blank@sheffield.ac.uk

Background: Demand management describes any method used to monitor, direct or regulate patient referrals. Several strategies have been developed to manage the referral of patients to secondary care, with interventions targeting primary care, specialist services, or infrastructure.

Objective: This research aimed to conduct an inclusive systematic review and logic model synthesis in order to better understand factors impacting on the effectiveness of interventions targeting referral between primary and secondary medical health care.

Design: The approach combined systematic review with logic modelling synthesis techniques to develop an evidence-based framework of factors influencing the pathway between interventions and system-wide changes.

Setting: Primary health care.

Main outcome measures: Referral from primary to secondary care.

Review methods: Systematic searches were undertaken to identify recent, relevant studies. Quality of individual studies was appraised, with consideration of overall strength of evidence. A narrative synthesis and logic model summary of the data was completed.

Results: From a database of 8327 unique papers, 290 were included in the review. The intervention studies were grouped into four categories of education interventions ($n = 50$); process change interventions ($n = 49$); system change interventions ($n = 38$); and patient-focused interventions ($n = 3$). Effectiveness was assessed variously in these papers; however, there was a gap regarding the mechanisms whereby these interventions lead to demand management impacts. The findings suggest that, although individual-level interventions may be popular, the stronger evidence relates only to peer-review and feedback interventions. Process change interventions appeared to be more effective when the change resulted in the specialist being provided with more or better quality information about the patient. System changes including the community provision of specialist services by general practitioners, outreach provision by specialists and the return of inappropriate referrals appeared to have evidence of effect. The pathway whereby interventions might lead to service-wide impact was complex, with multiple factors potentially acting as barriers or facilitators to the change process. Factors related, first, to the doctor (including knowledge, attitudes and beliefs, and previous experiences of a service), second, to the patient (including condition and social factors) and, third, to the influence of the doctor–patient relationship. We also identified a number of potentially influential factors at a local level, such as perceived waiting times and the availability of a specialist. These elements are key factors in the pathway between an intervention and intended demand management outcomes influencing both applicability and effectiveness.

Conclusions: The findings highlight the complexity of the referral process and multiple elements that will impact on intervention outcomes and applicability to a local area. Any interventions seeking to change referral practice need to address factors relating to the individual practitioner, the patient and also the situation in which the referral is taking place. These conclusions apply especially to referral management in a UK context where this whole range of factors/issues lies well within the remit of the NHS. This work highlights that intermediate outcomes are important in the referral pathway. It is recommended that researchers include measure of these intermediate outcomes in their evaluation of intervention effectiveness in order to determine where blocks to or facilitators of system-wide impact may be occurring.

Study registration: The study is registered as PROSPERO CRD42013004037.

Funding: The National Institute for Health Research Health Services and Delivery Research programme.

Contents

List of tables

List of figures

List of abbreviations

CBDS	computer-based decision support
CI	confidence interval
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CMHT	community mental health team
COPD	chronic obstructive pulmonary disease
CT	computerised tomography
df	degree of freedom
DRAC	direct-referral audiology clinic
DXA	dual-energy X-ray absorptiometry
ECG	electrocardiogram
eGFR	estimated glomerular filtration rate
EMR	electronic medical record
ENT	ear, nose and throat
GI	gastrointestinal
GP	general practitioner
GPwSI	GP with special interest
GRAIDS	Genetic Risk Assessment on the Internet with Decision Support software
ICC	intracluster correlation coefficient
ICD-10	*International Classification of Diseases*, Tenth Edition
LEEP	loop electrical excision procedure
LRL	letter and referral list
LUTS	lower urinary tract symptoms
MRI	magnetic resonance imaging
NICE	National Institute for Health and Care Excellence
nRCT	non-randomised controlled trial
OR	odds ratio
PCDS	primary care dermatology service
PCT	primary care trust
PDA	personal digital assistant
PSA	prostate-specific antigen
QALY	quality-adjusted life-year
QOF	Quality and Outcomes Framework
RCGP	Royal College of General Practitioners
RCT	randomised controlled trial
RR	relative risk
SD	standard deviation
SE	standard error
SPR	single point of referral
TIA	transient ischaemic attack

Plain English summary

People who go to see their doctor often need to be referred to other specialist services in hospital or other settings. There are many different ways of managing this process. Our study examined research which has been carried out and published in scientific journals to try to understand what works best and what factors will affect if and how interventions to manage the way that referrals are made will work.

We examined 290 relevant studies and found that four main types of interventions were used to try to improve how referrals are made. These were educating doctors; making changes to the way referrals are carried out; changing the health-care system; and interventions targeting patients. The studies we looked at emphasised how factors within individual doctors (such as their knowledge and attitudes), and factors related to patients (such as their attitudes and beliefs), could affect whether or not a referral was made. In addition, factors relating to a patient's condition and to the health-care environment could be influential. We used the factors mentioned by the research to develop a diagram (a logic model), which shows all of the things that will influence whether or not an intervention may make a difference to the way referrals are made. We have shown which types of intervention have stronger or weaker evidence for their use. The study thus provides a summary of evidence which can be used to help to decide which sort of interventions could be best in the NHS.

Scientific summary

Background

Demand management, although often thought of as a means solely to limit the volume of referrals from primary to secondary care, is a term which is used in a much broader way to refer to any method that has the aim of monitoring, directing or regulating patient referrals. Several strategies have been developed in order to manage the referral of patients to secondary care. These interventions may target primary care or specialist services, or, alternatively, a whole health-care-system infrastructure. It is increasingly recognised that most interventions in health care can be considered to be complex. The increasing complexity of the intervention is accompanied by a corresponding growth in the challenges presented for standard methods of evaluation and synthesis. New methods of systematic review have been developed in response to the need to go beyond reporting the effectiveness of experimental studies, to exploring how and why interventions may work, and the assumptions underpinning the processes whereby an intervention may effect change in a particular context. Logic model methods are a form of theory-based evaluation that focus on relating hypothesised links between an intervention and its constituent parts to its outcomes and long-term impacts. They are a useful method for synthesising review findings, in particular when examining complex interventions which may operate at a whole-system level. A logic model diagram enables the pathway between an intervention and its intended outcomes to be constructed in detail, thereby uncovering assumptions and processes that need to be considered when designing and evaluating interventions, and when considering the applicability of findings to a local context.

Objectives

The study aimed to examine the available literature in order to answer the following research questions:

- What can be learned from the international evidence on interventions to manage referral from primary to specialist care?
- How can international evidence on interventions to manage referral from primary to specialist care be applied in a UK context?
- What factors affect the applicability of international evidence in the UK?
- What are the pathways from interventions to improved outcomes?

Methods

The study employed conventional rigorous systematic review methods for the identification of evidence. Systematic searches of published and unpublished (grey literature) sources from health care and other industries were undertaken to identify recent, relevant studies. An iterative (i.e. a number of different searches) and emergent (i.e. the understanding of the question develops throughout the process) approach was taken to identify evidence. Citation searches of included articles and systematic reviews were also undertaken, as was hand-checking of reference lists of all included articles.

The included studies were examined and data were synthesised via tabulating and comparison and a narrative summary detailing types of intervention and outcomes. In addition, the data were used to construct a diagram illustrating the change pathway (a logic model).

Inclusion and exclusion criteria

- Participants: all primary care medical physicians, hospital specialists and their patients.
- Interventions: interventions that aim to influence and/or affect referral from primary care to specialist services by having an impact on the referral practices of the primary physician. In addition, interventions that aim to improve referral between specialists where they also have the potential to impact on primary care to specialist referrals.
- Comparators: the main comparator condition for intervention studies was the usual method of referral practice which is undertaken in the location where the intervention is being implemented. However, alternative comparators were not excluded. We also included studies with no concurrent comparator (e.g. non-controlled before-and-after studies), as well as qualitative studies where comparators are not relevant.
- Outcomes: all outcomes relating to referral were considered, including referral rate, referral quality, appropriateness of referral, impact on existing service provision, costs, mortality and morbidity outcomes, length of stay in hospital, safety, effectiveness, patient satisfaction, patient experience and process measures (such as referral variation and conversion rates). All qualitative outcomes were also considered for the relevant papers.
- Study design: no restrictions were placed on study design. The criterion for inclusion in the review was that a study is able to answer or inform the research questions. However, we evaluated the quality of study design and execution and how these may affect the reliability of the results generated.

Results

In total, our searches generated a database of 8327 unique papers. We included 290 full papers in the review and excluded a total of 286 papers which were obtained as full papers but were subsequently found to be outside the scope of the review. The included papers consisted of 140 intervention papers and 154 non-intervention 'views and predictors' papers, that is, papers that looked at the views of patients and professionals on the referral process and at factors that predict referral.

We first scrutinised the papers reporting interventions, examining the content of each, the process whereby the intervention was delivered and the intended outcomes in order to begin to characterise and sort the data. The intervention studies were grouped into four categories: education interventions ($n = 50$ papers); process change interventions ($n = 49$ papers); system change interventions ($n = 38$ papers); and patient-focused interventions ($n = 3$ papers). The studies used a wide range of outcomes to determine effectiveness, encompassing referral rate ($n = 62$), service usage ($n = 18$), appropriateness of referral measures ($n = 24$), referral quality indicators ($n = 10$), appropriate actioning of referral measures ($n = 10$), waiting-time period ($n = 8$), costs of providing the service ($n = 12$), and practitioner or patient satisfaction/attitudes ($n = 27$).

An examination of the strength of evidence underpinning these interventions and outcomes indicated that there was stronger evidence of effect for interventions comprising peer review/feedback; improvement of referral information; specialist contact prior to referral; electronic referral; provision of specialist services by community medical practitioners; and community provision of specialists. There was conflicting or weaker evidence for other interventions reported.

As outlined above, the interventions used a range of outcomes to evaluate effectiveness. The process whereby these interventions led to the intended system-level demand management outcomes was unclear, however, with a need for a detailed exploration regarding how exactly the intervention would act on participants and systems in order to produce the expected demand management outcomes. This understanding of the pathway underpinning the effectiveness of interventions was a key aspect in exploring the applicability of this evidence to a UK and local NHS context.

In logic model methods, this element in construction of a pathway is typically called the theory of change, sometimes referred to as the programme theory, which sets out the key change mechanisms following an intervention. We further examined the intervention papers in order to identify exactly what mechanisms were intended to lead to the demand management effect. As will be seen from the outcomes listed above, few interventions examined these immediate (or short-term) outcomes; instead, studies used measures relating to the impact on referral quantity or quality. There was thus a gap in the intervention literature concerning how exactly these interventions might operate in order to have an effect on referrals. This gap, however, is key to understanding how the available evidence on referral management can be applied in a UK context. The non-intervention literature provided insights into these missing elements of the pathway. Factors highlighted as key in any change process in this literature were those relating, first, to the general practitioner [(GP) including GP knowledge, GP attitudes and beliefs and GP referral behaviour], second, to the patient (including patient knowledge and patient attitudes and beliefs) and, third, to the influence of the doctor–patient relationship. In addition to these elements at an individual level which interventions need to act upon, studies reported a number of moderating factors (or barriers and facilitators) which could impact on the success of any intervention relating to the local health-care context and system (such as waiting times, size of practice, location of services and availability of specialists). These elements will influence the applicability of and potential effectiveness of any intervention in a local health-care context.

Conclusions

This systematic review and logic model synthesis demonstrates the complexity of the referral process and multiple elements that will impact on intervention outcomes. It illustrates the multitude of assumptions that are made between interventions and demand management outcomes and that successful referral outcomes are highly dependent on the individuals involved in the referral and also the context in which the referral is taking place. Furthermore, in relation to context, the complexity of the intervention-outcomes pathway highlights that, in order to tackle demand management of primary-care services, the focus cannot be on primary care alone – a whole-systems approach is needed as the introduction of interventions in primary care is often just the starting point of the referral process.

The findings suggested that, although individual-level interventions may be popular, the stronger evidence relates only to peer-review and feedback interventions. Process change interventions appeared to be more effective when the change resulted in the specialist being provided with more or better quality information about the patient. System changes, including the community provision of specialist services by GPs, outreach provision by specialists and the return of inappropriate referrals, appeared to have evidence of effect.

Our research questions focused on the applicability of the evidence that we found to the UK NHS context. Although the evidence identified was international in nature and some of it originates from countries with very different health-care systems and processes from the UK, the vast majority of studies had relevance in the UK within a universal health-care setting such as the NHS, in which it is possible to influence and indeed manage the whole range of provision from GP to secondary-care provider. The international evidence suggests that individual peer-review/feedback interventions, and some process change and system change interventions, may be effective and applicable in the UK. The review, however, highlighted the role of local factors such as waiting times, access to specialists and workload, which may influence the success of any intervention. It is likely that local differences between specialties, UK demographic variation and elements that the review identified relating to individual patients and practitioners will have a stronger impact on the effectiveness and applicability of the interventions identified than country of origin. Possible exceptions to this consideration of applicability in the UK are two types of system change interventions, namely the addition or removal of gatekeeping systems and changes to health-care payment systems. It might take more fundamental revision of existing NHS management and procedures to make these types of changes within the UK. However, the review identified few studies evaluating these systems, with evidence of their effectiveness in managing demand conflicting.

Study registration

This study is registered as PROSPERO CRD42013004037.

Funding

Funding for this study was provided by the Health Services and Delivery Research programme of the National Institute for Health Research.

Chapter 1 Background

Demand management defines any method used to monitor, direct or regulate patient referrals. This includes the methods by which patients are referred from primary care to specialist, non-emergency care provided in hospital. This interface between primary and secondary care is a pivotal organisational feature in many health-care systems, including the NHS. In the UK, primary-care physicians act as the gatekeeper for patient access to secondary care and are responsible for deciding which patients require referral to specialist care. Similar models are found in health-care systems throughout the developed world, for example Australia, Denmark and the Netherlands.[1] Elsewhere, self-referral dominates (e.g. France), or the colocation of primary and specialist services leads to a variety of referral pathways (e.g. the USA). As demand outstrips resources in the UK, the volume and appropriateness of referrals from primary care to specialist services has become a key concern within the NHS. Worldwide, shifts in demographics and disease patterns, accompanied by changes in societal expectations and the relationship between professionals and patients (including the influence of the internet), are driving up treatment costs. As a result of this, several strategies have developed to manage the referral of patients to secondary care, with interventions that target primary care, specialist services or infrastructure (such as referral management centres).

Recent reviews of referral management interventions

The effectiveness of interventions to improve outpatient referrals from primary to secondary care has been the subject of a Cochrane review.[1] The Cochrane review searched for only high-quality, controlled studies and found 17 published papers. The authors concluded that there was insufficient evidence on organisational and financial interventions aimed at primary care, and also inconclusive evidence on effective educational interventions. They did, however, suggest that focusing on potentially effective interventions such as secondary care provider-led education activities, structured referral management sheets, enhancement of primary care and in-house second opinions should guide further research.
A previous review on the effects of service innovation on the quality and pattern of referrals from primary care predates recent innovations such as referral management centres.[2] This previous review concluded that professional interventions such as guidelines and education, although able to affect clinical behaviour, had limited effect on referral rates, whereas organisational innovations were more likely to affect referral rates. Further to this, Dunst and Gorman[3] reanalysed the Faulkner review along with the previous Cochrane review[4] and concluded that interventions that more actively involved primary-care physicians were more effective in influencing rates and patterns of referral.

More recently, referral management in the general practitioner (GP) context has been the subject of work funded by The King's Fund.[5] Their report highlights the concerns of many with regard to the risks of managing demand without taking account of patient safety, acknowledging that referral management has the capacity to increase clinical risk as well as to reduce it. In considering whether or not one approach to referral management is 'better' than another, they suggest that 'light touch interventions' such as peer review and feedback, alongside the use of guidelines and structured referral sheets, may offer the most cost-effective approach. However, although the report contributes important insights, it does not suggest best practice examples of these interventions or how they would best be implemented in practice.

Theoretical/conceptual framework

It is increasingly recognised that most interventions in health care can be considered to be complex, with individual and organisational factors affecting how and if interventions lead to improved outcomes.[6] This recognition of the complexity of interventions has been accompanied by a corresponding growth in the challenges for standard methods of evaluation and synthesis. Evidence-based practice requires policy-makers and practitioners to have readily available access to information on interventions that have

been shown to work or not work, or indeed have the potential to cause harm. Systematic reviews are an established way of exploring the effectiveness of interventions and a cornerstone of evidence-based practice in order to identify, evaluate and summarise the findings of all available research evidence. Methods for carrying out systematic reviews have become increasingly refined, led by Cochrane, the National Institute for Health and Care Excellence (NICE) and the Centre for Reviews and Dissemination which details the formal procedures required. Conventional systematic review methods, however, face challenges in establishing clear intervention-outcome links when complex multifactorial processes are operating, and there are few experimental studies to draw upon.

As much of the international evidence in the area of referral management is observational in nature and lacks control comparators, our work builds on previous reviews by taking broader inclusion criteria (to include all study designs and grey literature, as well as evidence from other industries). The review findings are presented via a conceptual model (a logic model), which details the range of interventions identified, evidence of their effectiveness and factors which may influence how and if interventions lead to demand management outcomes. The work not only explores the effectiveness of interventions for demand management, but also aims to uncover detail of the processes whereby interventions may lead to an impact on health-care systems in order to determine applicability to the UK context.

Logic models

Logic model methods are a form of theory-based evaluation that focus on relating hypothesised links between an intervention and its constituent parts to its outcomes and long-term impacts. Logic models are concerned with examining the processes of implementation, mechanisms of change and participant responses in order to develop hypothesised links or a 'theory of change.'[7] In order to develop a theory of change, it is necessary to understand the moderator and mediator variables in the process.[8] These factors are the key to understanding how an intervention works and how interventions may work in different health-care contexts. Logic model evaluation methods begin by mapping out an intervention and then examining conjectured links between the intervention activities and anticipated outcomes to develop a summarised theory of how an intervention works, usually in diagrammatic form. Outcomes are conceptualised as being the end of a chain of intermediate changes which the evaluation process seeks to track, with each intermediate point predicting the outcomes that may occur in the future.[9] Logic models have been suggested as a means to help to provide a strategic perspective on complex programmes and to understand the relationships between various elements of an intervention and outcomes.[10] In particular, they are recommended for evaluating highly complex, multisite interventions with multiple and/or indeterminate outcomes.[11]

The area of referral/demand management has many of the same challenges as other complex interventions. A key issue relates to the diversity of the many different referral management approaches that have been investigated, which involve varying degrees of active intervention in referral systems and processes. Understanding how these interventions operate is important when evaluating applicability between different systems and contexts. Logic model methods are underpinned by a systems perspective and provide a mechanism for evaluating system impacts, and for supporting managers in presenting a logical argument for how and why an intervention will address a specific need. There has been growing interest in applying the approach to evaluation of health care. It has been highlighted, for example, that hospitals need to look at the logistics of their patient-pathway processes and use a systems perspective to examine flows through the process. Referral management entails moving from a system that reacts in an ad-hoc way to meet increasing needs to one that is able to plan, direct and optimise services in order to optimise demand, capacity and access across an area. Uncovering the assumptions and processes within a referral management intervention, therefore, requires an understanding of system operation and assumptions which the logic model methodology is well placed to address.

Research questions

This research was designed to conduct an inclusive systematic review and develop a logic model to answer the following research questions:

- What can be learned from the international evidence on interventions to manage referral from primary to specialist care?
- How can international evidence on interventions to manage referral from primary to specialist care be applied in a UK context?
- What factors affect the applicability of international evidence in the UK?
- What are the pathways from interventions to improved outcomes?

Chapter 2 Review methods

A review protocol was developed for the project and can be found at www.nets.nihr.ac.uk/__data/assets/pdf_file/0007/81178/PRO-11–1022–01.pdf.

Inclusion and exclusion criteria

Participants: all primary care medical physicians, hospital specialists and their patients.

Interventions: interventions that aim to influence and/or affect referral from primary care to specialist services by having an impact on the referral practices of the primary physician; in addition, interventions that aim to improve referral between specialists or have the potential to impact on primary care to specialist referrals.

Comparators: the main comparator condition for intervention studies was the usual method of referral practice which is undertaken in the location where the intervention is being implemented. However, alternative comparators have not been excluded. We also included studies with no concurrent comparator (e.g. non-controlled before-and-after studies), as well as qualitative studies where comparators are not relevant.

Outcomes: all outcomes relating to referral were considered, including referral rate, referral quality, appropriateness of referral, impact on existing service provision, costs, mortality and morbidity outcomes, length of stay in hospital, safety, effectiveness, patient satisfaction, patient experience and process measures (such as referral variation and conversion rates). All qualitative outcomes were also considered for the relevant papers.

Study design: with the increasing recognition in the literature that a broad range of evidence is needed to inform review findings, no restrictions were placed on study design. The criterion for inclusion in the review was that a study is able to answer or inform the research questions. We have, however, taken note of how quality of study design and execution may affect the reliability of the results generated, as discussed below.

Identification of evidence

Search strategy

Searches were limited by date (January 2000 to July 2013). Articles generated by our searches that consisted of English abstracts only, with full papers published in other languages, were considered for translation, but none was found to meet the inclusion criteria for the review. Our international collaborators did not identify any key articles in other languages, which might have required translation.

All of the literature identified using the above methods were imported into Reference Manager Version 12 (Thomson ResearchSoft, San Francisco, CA, USA) and key-worded appropriately. An audit table of the search process was kept, with date of search, search terms/strategy, database searched, number of hits, keywords and other comments included, in order that searches were transparent, systematic and replicable. Searches took place between November 2012 and July 2013. Search strategies and a full list of data sources are given in *Appendices 3* and *4.*

At the outset of the project a steering group of our international collaborators, relevant patient representatives and other stakeholders was formed. This group had the opportunity to suggest terms to be considered for inclusion in the initial search strategy as well as identifying key articles for potential inclusion.

Initial search

Systematic searches of published and unpublished (grey literature) sources from health care and other industries were undertaken to identify recent, relevant studies. An iterative (i.e. a number of different searches) and emergent (i.e. the understanding of the question develops throughout the process) approach was taken to identify evidence.[12,13]

An initial search was generated to address the project research questions, with free-text and subject-heading terms combined to address the concepts of 'primary care' and 'referral'. A broad range of electronic database, including MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO and Health Business Elite, was searched in order to reflect the diffuse nature of evidence (see *Appendices 3* and *4*).

Databases that focus on health management literature, such as the Health Management Information Consortium and Health Business Elite, and management databases such as Business Source Premier and Emerald Management Reviews, were also searched using the initial search strategy.

Additional searches

After the initial search a phrase search was undertaken for 'referral management centres' in MEDLINE and CINAHL (for full details of data sources see *Appendix 3*). This was to make sure that papers had not been missed which described this particular referral method.

As the work progressed, further searches were required in order to seek additional evidence where there were gaps and implicit assumptions that particular outcomes would result following interventions described later.

Citation searches

Citation searches of included articles and systematic reviews were undertaken in the Science Citation Index and Social Science Citation Index and respective conference papers indices. Where a search returned no results, a search in Scopus was undertaken to double check for any registered citations. Relevant reviews articles were also used to identify studies.

Grey literature

Grey literature (in the form of published or unpublished reports, or data published on websites, in government policy documents or in books) was searched for using the OpenGrey (www.opengrey.eu), Greysource (www.greynet.org) and Google Scholar (http://scholar.google.com; Mountain View, CA, USA) electronic databases.

Reference list checking

Hand-searching of reference lists of all included articles was also undertaken, including relevant systematic reviews.

Selection of papers and data extraction

Citations were uploaded to Reference Manager, and titles and abstracts (where available) of papers were independently screened for inclusion by two reviewers, with disputes resolved by consulting other team members. Full-paper copies of potentially relevant articles were retrieved for systematic screening. A data extraction form was developed using the previous expertise of the review team, trialled using a small number of papers and refined for use here. Data extractions were completed by one reviewer and checked by a second.

Extraction data included country of the study, study design, data collection method, aim of the study, detail of participants (number; any reported demographics), study methods/intervention details, control details, length of follow-up, response and/or attrition rate, context (referral from what/who to what/who), outcome measures, main results and reported associations between elements for the logic model.

Data synthesis

The heterogeneity of the interventions' aim, design and outcome measures used precluded a meta-analysis of their results. We therefore completed a narrative synthesis of the data, primarily in terms of type of intervention and outcomes. In addition, we built on our previous methodological work[14,15] and thematic synthesis methods,[16] and used the data to develop a diagrammatic representation (logic model) of the factors that may influence the pathway from interventions to system-wide impacts. The model aimed to portray how interventions operate in order to change practice at individual, local and system-wide levels.

Quality appraisal

Individual studies

The critical appraisal of included evidence is a key part of the review process; however, it is the subject of debate in the field, with no single recognised tool. There is also variation in views regarding the use of scoring systems, with Cochrane discouraging the use of systems which total elements on a checklist, as a single item may jeopardise an entire study. In this review, the quality of studies was assessed using a checklist based on work by Cochrane (see *Appendix 2*). This approach considers risk of bias and, as it is usually used with experimental studies, required some modification for use with our wider range of study designs. Qualitative papers were evaluated using an adaptation of the Critical Skills Appraisal Program tool. Each paper was assessed by one reviewer and checked for accuracy by a second. Each paper was graded on a three-point scale as being at higher risk of bias, lower risk of bias or unclear risk of bias. The rating was based on not only an aggregate (the number of items) but also an overall judgement of risk of bias. It is important to note that our rating was comparative (higher vs. lower) across the set of papers, with a study classed as being at lower risk not meaning that it was necessarily low risk (see the assessment of each study detailed in *Appendix 2*). Study design criteria for inclusion in the review were not set as the work was intended to be broad-based and inclusive. Inclusion required only that the paper was able to answer the research question; however, we took account of quality standards in the synthesis and presentation of the evidence as will be outlined below.

Appraising the strength of the evidence

Although there is debate regarding rating of quality of individual studies, there is also considerable variation in views regarding methods for appraising strength of evidence across studies, with a higher number of papers in an area indicating not necessarily greater strength of evidence but only that more work has been carried out. We adopted a system that combined consideration of volume of evidence, and also consistency of evidence, with quality of evidence, based on work by Hoogendoorn *et al.*[17] Evidence strength appraisal was undertaken by the research team at a series of meetings to establish consensus. Each group of papers was graded as (i) stronger evidence, (ii) weaker evidence or (iii) inconsistent/no evidence.

Stronger evidence (i) was defined as generally consistent findings in multiple higher-quality studies.

Weaker evidence (ii) was defined as generally consistent findings in one higher-quality study and lower-quality studies, or in multiple lower-quality studies.

No evidence or inconsistent evidence (iii) was defined as only one study available or inconsistent findings in multiple studies. Study findings were considered to be inconsistent if fewer than 75% of studies reported the same conclusions.

Validation and applicability of the findings

Following completion of the evidence appraisal and draft logic model synthesis, we undertook a period of stakeholder consultation to seek feedback on the evidence that we had identified and the applicability of the findings to the UK health-care context. This consultation was carried out via presentations to practitioners and patient representatives, via individual meetings to discuss the findings, and by circulating the model to experts in the field (including practitioners, commissioners and academics). In total, 44 individuals contributed to this validation stage. In order to assess how our findings resonated with other work in the field, we also carried out a review of other reviews in the area.

Chapter 3 Results of the review

Quantity of the evidence available

In total, our searches generated a database of 8327 unique papers. Of these, 580 papers were selected for consideration at the full-paper stage. After considering these, searching reference lists and completing the validation stage of the project, 290 full papers were included in the review (*Table 1*).[18–308] The included papers consisted of 140 intervention papers and 150 non-intervention papers (looking at the views of patients and professionals on the referral process, and factors which predict referral). The 150 non-intervention papers included qualitative studies ($n = 33$) and non-intervention quantitative studies such as surveys and research reporting associations ($n = 117$). Grey literature searches generated 69 potentially relevant articles but no additional articles were subsequently found to be within the scope of the review. This was probably due to the fact that a number of grey literature reports had already been identified in the previous searches.

Of the intervention papers, 114 were identified through the initial database searches, 14 were identified through citation searches, one was identified through additional targeting searching and 10 additional papers were identified through scrutinising reference lists (including those of systematic reviews). One further study was identified at the validation stage of the logic model.

Of the non-intervention studies, 140 were identified through the initial database searches, two were identified through citation searches and six were identified through additional targeting searching, with two additional papers identified through scrutinising reference lists.

In addition, 30 systematic review papers in relevant topics were identified and a synthesis of these was developed in parallel with, but independently to, the logic model development. Comparison with the logic model synthesis is considered in *Appendix 6* of this report as part of the validation stage.

We excluded a total of 286 papers which were obtained as full papers but were subsequently found to be outside the scope of the review. A list of these papers and the reasons for their exclusion are given in *Appendix 5*. *Figure 1* details the process of identification of studies.

TABLE 1 Summary of study identification

Source	Number of hits	Number of papers included
Initial searches	6431	253
Additional searches	876	7
Citation searches of included papers	814	16
Reference list of included papers and systematic reviews	137	12
Grey literature	69	0
Validation stage	1	1
Total	8328	290

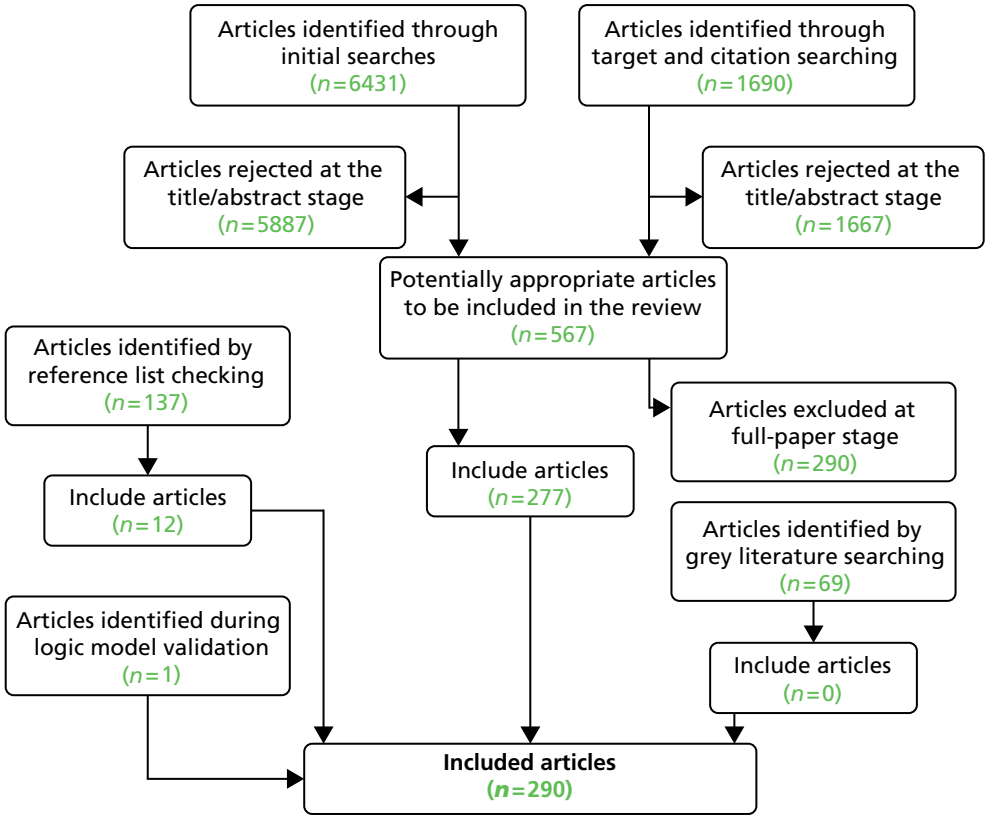


FIGURE 1 The process of identification of studies.

Quality of the evidence available

Of the 140 intervention studies, the vast majority ($n = 126$) were considered to be at lower risk of bias.[19,21–24,27–40,43–71,73–89,92–96,98–100,102–139,141,142,144–150,152,156–160] Fifteen intervention studies were considered to be at higher risk of bias,[25,26,42,72,90,91,97,129,140,143,151,153,154] including two studies where the risk of bias was unclear.[19,41] The main risks for bias related to a lack of participant details, only narrative results, percentages reported without supporting statistics, data reported as charts only, inconsistencies in data reporting, poor response rates, attrition rate not reported, weak outcome measures, unclear study design, and evaluation tools which asked questions that strongly led respondents towards positive answers.

Of the 33 qualitative studies, 32 were considered to be at lower risk of bias.[176,177,182,192,194,201,204,207,209,210,212,213,217,218,221,226,228–230,232,237,239,249,252,253,256–258,273,293,306] Only one was considered to be at higher risk of bias due to unclear aim, unclear process for selection of participants and data not clearly distinguished from report of other authors' work.[20]

Of the 117 non-intervention qualitative studies (surveys, etc.), 96 were considered to be at lower risk of bias,[98,101,138,161,163–181,183,187–189,191,193,195–200,206,211,215,216,219,220,222,223,225,231,234,235,238,240–243,245–248,250,251,254,259–270,272,274–276,278–294,297,299–305,307] with 21 studies considered to be at higher risk of bias.[162,165,184–186,190,202,203,205,208,214,224,227,233,236,244,255,271,277,295,306,308] The main risks for increased bias were attributable to studies being completed in one small sample only, limited recruitment details, poor response rate, leading questions, recall bias, unpiloted survey tools, unclear methods, limited data presentation, possible overstatement of findings and over-reliance on self-reported outcomes.

Although the higher-risk studies were not excluded from the synthesis and model, the risk of bias was accounted for in assessing the strength of evidence for each element of the model. The detailed quality assessment for each study is provided in *Appendix 2*.

Study designs

Of the 140 intervention studies, there were 44 randomised controlled trials (RCTs)[23,26,27,29–32,36,39,53,54,58–60,63–68,76,77,79,82,85–87,92–95,107,109,111,114,116,117,120,125,126,131,135,144,159] (including 19 of cluster design[30–32,39,53,58,63,65–68,77,79,86,111,114,117,120,131]), five non-RCTs (nRCTs),[62,108,127,130,134] 43 before-and-after studies (without a concurrent control group),[24,33–35,38,42,43,45,47–52,55,57,69,72–74,89,90,102,103,105,110,112,115,119,122,129,133,136,137,143,145,146,149,154,156–158,160] three controlled before-and-after studies,[56,70,81] one case–control study,[57] one economic analysis,[151] five cohort studies[28,46,71,104,128] and 38 evaluation studies (described variably as audits, review, evaluation and retrospective data analysis).[18,19,21,22,25,27,40,41,44,61,75,78,80,83,84,88,91,97–99,106,113,118,121,123,124,132,135,138,140–142,147,148,152,153,155,158]

Of the non-intervention views and predictors studies, the 33 qualitative studies consisted of qualitative interview studies ($n = 25$[20,163–165,171,177,178,180,183,192,194,196,201,204,207,210,212,213,237,239,245,249,253,258,260]), focus group studies ($n = 5$[217,230,232,252,257]), studies using both interviews and focus groups ($n = 2$[196,239]) and one study which used transcriptions of video tapes.[182] The non-intervention quantitative studies ($n = 117$) were mostly cross-sectional surveys ($n = 82$[29,108,161,168–175,178,179,181,183–185,187–191,193,195,198,200,202,203,205,206,208,209,211,214–216,219,220,222,224,225,227,231,232,234–236,238–240,242,244,246,248,250,251,259,261,263,264,268–282,284–287,289,291,292]). In addition, one study employed a follow-up survey; two studies used surveys and interviews,[176,186] and one further study also included a focus group.[233] There were also 29 studies which consisted of an analysis of patient records, documents, case notes, admissions data and referral forms.[138,166,167,173,197,219,223,235,241,243,254,256,263,265–267] Most of these studies ($n = 23$) were retrospective designs, but four employed a prospective cohort design.[173,223,254,266] In addition, one study employed Delphi methods[196] and one final study used a group-based assessment of referral appropriateness.[255]

Populations and settings

Of the 140 interventions, the majority were conducted in the UK ($n = 82$[18,19,21–23,26,28,30–32,34,37,38,41–62,64,65,68,70,71,73,74,76–80,82–85,94,96,99,103,104,106,109,114,116,117,119,122,124–126,128,129,131,133,139,140,142,143,152–157,159,160]) or the USA ($n = 20$[24,33,63,87,89,93,98,100,102,112,115,121,132,138,144–147,155,158]). There were 10 studies from the Netherlands[36,67,86,90,120,123,134,135,141,149] and nine from Australia.[49,72,91,97,105,111,118,136,148] Additional studies were conducted in Canada ($n = 3$[27,107,110]), Israel ($n = 3$[130,137,150]), Italy ($n = 3$[69,113,127]), Denmark ($n = 2$[29,92]), Spain ($n = 2$[35,75]), Finland ($n = 1$[95]), Norway ($n = 1$[151]), Hong Kong ($n = 1$[81]) and UK/China ($n = 1$[25]), with one final study where the country of origin was unclear.[101]

Of the non-intervention views and predictors studies, the 33 qualitative studies were conducted mostly in the UK ($n = 18$[177,180,182,192,194,201,204,207,209,210,218,228,229,249,252,253,257,258]), with additional studies from Australia ($n = 5$[169,176,221,226,245]), USA ($n = 5$[170,183,200,202,208]), the Netherlands ($n = 3$[212,237]), Norway ($n = 2$[164,217]), New Zealand ($n = 1$[20]) and Belgium ($n = 1$[230]). The non-intervention quantitative studies ($n = 117$) were mostly from the UK ($n = 35$[157,174,175,177,187,189,190,193,195,197,198,207,220,224,233,236,241–243,247,251,254–256,265,266,272,273,279,282,284,285,287,291,294]) and USA ($n = 31$[98,108,138,171,172,178,184,200,205,214,216,218,219,222,223,225,231,232,235,238,240,246,260,264,267,270,271,274,277,283,286,290,304,305,307]), with additional studies from Canada ($n = 13$[107,165,179,196,203,206,227,234,248,263,275,292,299]), Australia ($n = 10$[40,91,105,148,162,185,186,188,215,268]), the Netherlands ($n = 4$[163,191,212,250]), Norway ($n = 4$[164,168,239,244]), Israel ($n = 3$[167,261,269]), Germany ($n = 2$[173,211]), Denmark ($n = 2$[29,181]), New Zealand ($n = 2$[288,302]), France ($n = 1$[161]), Ireland ($n = 1$[280]), Belgium ($n = 1$[209]), Lithuania ($n = 1$[166]) and Spain ($n = 1$[276]). In addition, two studies were conducted in more than one country, namely the UK/Australia ($n = 1$[169]) and USA/Canada/Puerto Rico ($n = 1$[183]).

Types of interventions

In total 140 intervention papers were identified and used to create a typology of studies by intervention type. The intervention studies identified may be grouped into four categories: GP education interventions ($n = 49$[19,21,22–69]); process change interventions ($n = 47$[70–87,98–120]); system change interventions ($n = 41$[18,121–157]); and patient-focused interventions ($n = 3$[158–160]). It is accepted that this grouping of interventions may have some overlap; however, focus is on the content. *Table 2* provides a summary of the intervention studies grouped by typology.

TABLE 2 Intervention typology

Intervention category	Intervention type	Studies reporting a positive effect on referral outcomes (first author and year)	Studies reporting no effect on referral outcomes (first author and year)	Strength of evidence
GP education	Peer review and training/ feedback	**Cooper 2012,**[19] Evans 2009,[21] Evans 2011,[22] Jiwa 2004[23]		i
	GP training: professional development	Adams 2012,[33] Bennett 2001,[30] Donohoe 2000,[31] Hands 2001,[34] **Hilty 2006,**[24] Kousgaard 2003,[29] Ramsay 2003,[27] Suris 2007,[35] Watson 2001,[32] Wolters 2005[36]	Bhalla 2002,[37] Ellard 2012,[38] Emmerson 2003,[40] **Lam 2011,**[25] Lester 2009,[39] **Rowlands 2003,**[26] Shariff 2010[28]	iii
	Guidelines (no training/ feedback)	Cusack 2005,[43] Idiculla 2000,[44] Lucassen 2001,[45] **Malik 2007,**[41] Imkampe 2006,[47] Potter 2007,[46] **Twomey 2003**[42]	Fearn 2009,[48] Hill 2000,[49] Matowe 2002,[50] Melia 2008,[51] West 2007[52]	iii
	Guidelines with training/ feedback/ specialist support	Banait 2003,[53] Eccles 2001,[54] Elwyn 2007,[55] Glaves 2005,[57] Griffiths 2006,[58] Julian 2007,[62] Kerry 2000,[59] Robling 2002,[60] Walkowski 2007,[63] White 2004,[61] Wright 2006[56]	Dey 2004,[66] Engers 2005,[67] Jiwa 2006,[68] Morrison 2001,[64] Spatafora 2005,[69] Wilson 2006[65]	iii
Process change	Direct access to screening/ diagnostic testing	DAMASK 2008,[76] Shaw 2006,[77] Simpson 2010,[78] Thomas 2003,[79] Thomas 2010,[80] Wong 2000[81]	Dhillon 2003,[82] Eley 2010,[83] Gough-Palmer 2009[84]	iii
	Designated appointment slots/fast-track clinic	Bridgman 2005,[70] Hemingway 2006,[73] Khan 2008,[71] **Sved-Williams 2010**[72]	McNally 2003,[74] Prades 2011[75]	iii
	Specialist consultation prior to referral	Eminovic 2009,[86] Harrington 2001,[93] **Hockey 2004,**[91] Jaatinen 2002,[95] **Knol 2006,**[90] Leggett 2004,[85] McKoy 2004,[89] Nielsen 2003,[92] **Tadros 2009,**[96] Wallace 2004,[94] Whited 2002[87]		i
	Electronic referral	Chen 2010,[100] Dennison 2006,[99] Gandhi 2008,[108] Jiwa 2012,[105] Kim 2009,[98] Kim-Hwang 2010,[102] Nicholson 2006,[97] Patterson 2004,[104] Stoves 2010[103]	Kennedy 2012[106]	i
	Decision support tool	Akbari 2012,[110] Emery 2007,[111] Junghans 2007,[109] Knab 2001,[112] Mariotti 2008,[113] McGowan 2008[107]	Greiver 2005,[114] Magill 2009,[115] Slade 2008,[117] Tierney 2003[116]	iii
	Waiting list review	Stainkey 2010[118]	King 2001,[119] van Bokhoven 2012[120]	iii

TABLE 2 Intervention typology (*continued*)

Intervention category	Intervention type	Studies reporting a positive effect on referral outcomes (first author and year)	Studies reporting no effect on referral outcomes (first author and year)	Strength of evidence
System change	Community provision of 'specialist' services by GPs	Callaway 2000,[121] Ridsdale 2008,[124] Salisbury 2005,[125] Sanderson 2002,[126] Sauro 2005,[127] Standing 2001,[122] Van Dijk 2011[123]	**Levell 2012,**[129] Rosen 2006[128]	i
	Additional primary care staff		**Simpson 2003,**[143] Van Dijk 2010,[141] White 2000[142]	i
	Outreach: community provision by specialists	Campbell 2003,[131] Felker 2004,[132] Gurden 2012,[133] Hermush 2009,[137] Hughes-Anderson 2002,[136] Leiba 2002,[130] Schulpen 2003,[134] Vlek 2003[135]	**Johnson 2008,**[139] Pfeiffer 2011[138]	i
	Return of inappropriate referrals	**Tan 2007,**[140] Wylie 2001[18]		ii
	Gatekeeping		Ferris 2001,[145] **Ferris 2002,**[146] Joyce 2000,[147] Schillinger 2000[144]	iii
	Payment system	McGarry 2009[148]	**Iversen 2000,**[151] Van Dijk 2013,[149] Vardy 2008[150]	iii
	Referral management centre	**Maddison 2004,**[154] Watson 2002,[152] **Whiting 2011**[153]	Cox 2013,[156] Ferriter 2006,[157] Kim 2004[155]	iii
Patient inventions	Patient education	Lyon 2009[160]	Heaney 2001[159]	iii
	Patient concerns and satisfaction	Albertson 2002[158]		iii

Bold text indicates studies at higher risk of bias.

General practitioner education interventions

The GP education intervention group included peer-review and feedback ($n = 4$) interventions, which consisted of formal GP training (including continued professional development) ($n = 17$) and the issuing of guidelines [with ($n = 18$) and without ($n = 11$) additional formal training and support for practitioners].

Peer review

Peer-review training/feedback was offered to GPs (plus advanced health-care practitioners and practice managers) in one study[19] either in face-to-face meetings[19,21,22] or via written feedback.[23] Follow-up was for a minimum of 1 year in all cases. Details of each study are outlined in *Table 3*.

TABLE 3 Characteristics of peer-review interventions

Study	Intervention	Design	Country	Specialty	Sample size and details where provided	Study duration (follow-up)
Cooper 2012[19]	**Face-to-face peer review**	**Audit**	**UK**	**Orthopaedics**	**NR**	**5 years**
Evans 2009[21]	Face-to-face peer review	Audit	UK	Emergency, orthopaedics	Nine GP practices	1 year
Evans *et al.* 2011[22]	Face-to-face peer review	Audit	UK	Seven specialties	10 GP practices (53 GPs) Seven specialties 21 female GPs, median aged 44 years	1 year
Jiwa *et al.* 2004[23]	Written peer review	nRCT	UK	Specialists	26 GPs in intervention group	18 months (6 months)

NR, not reported.
Bold text indicates study at higher risk of bias.

Two studies were at lower risk of bias. Evans[21] reported, on average, a significant drop in referrals between the first and fourth quarters ($z = 2.25$, $p = 0.025$). The quality of referrals as judged by doctors' peers improved and referral rates in orthopaedics showed a reduction of up to 50%. However, variability between practices decreased and referral to local services increased. In 2011 they further reported a reduction in variation in individual GP referral rates (from 2.7–7.7 to 3.0–6.5 per 1000 patients per quarter), and a related reduction in overall referral rates (from 5.5 to 4.3 per 1000 patients per quarter).[22] Although the highest individual referrers showed a decrease, the lowest referrers may show an increase in referrals [and a significant negative correlation comparing the first month's data with the change from first to last month ($r = 0.719$, $p = 0.019$)].[22] Jiwa *et al.*[23] reported a difference of 7.1 points [95% confidence interval (CI) 1.9 to 12.2 points] in the content scores between the feedback group and the controls after adjusting for baseline differences between the groups. There was a considerable improvement in the content of the referral letters from the feedback group from before to after feedback (mean score 34.1 vs. 39.5). There was no improvement in the scores for the control group in the same period [mean score 34.1 vs. 28.2; mean difference 5.3 (95% CI 1.5 to 9.2)/mean difference 0.55 (95% CI –1.4 to 2.5); *t*-test degrees of freedom (df) 20/36; $p = 0.008/0.6$].

One further study was at higher risk of bias. Cooper[19] conducted a peer-review scheme for referrals with two guiding principles: the review would benefit the practice and the commissioning group; and there was no blame. GPs, nurses, advanced health-care practitioners and practice managers attended a workshop event and each practice bought two or three trauma and orthopaedic referral letters. Participants worked at mixed tables to understand each practice's referral profile, share how each practice would handle each situation and then identify any gaps or areas of changed needed. As a result they reported that trauma and orthopaedic expenditure in 2010–11 was 17% less than in 2006–7; in addition, one practice cut ear, nose and throat (ENT) referrals by 20% in the first year and 40% overall.

Formal general practitioner training

Seventeen interventions consisted of formal GP training. Overall, 11 studies reported a positive impact on referral,[24,27–36] with six showing no effect or a negative change.[25,26,37–40] Three studies were considered to be at higher risk of bias.[24–26] Overall, the strength of this evidence was graded as inconsistent.

The interventions themselves were varied and it was challenging to separate them further for analysis given the diversity of the interventions delivered. However, seven interventions were delivered in one single session (*Table 4*) and 10 sessions were delivered over a number of weeks or months (*Table 5*). The single-session interventions consisted of educational reminders added to radiographs requested by GPs;[27] an educational module and 12-page printed guide;[28] a structured information pack sent to GPs when their patients attended the department of oncology for the first time;[29] an education video;[30] in-practice education session plus information pack;[31,32] and a 1-day interactive chronic obstructive pulmonary disease (COPD) programme.[33]

Six of the 'one-session' interventions (see *Table 4*) showed positive effects on referral outcomes and were at lower risk of bias.

Adams *et al.*[33] delivered a 1-day interactive COPD continuing medical education programme. Knowledge/comprehension significantly improved {mean [standard deviation (SD)] pre-test percentage correct, 77.1% (16.4%); 95% CI 76.2% to 78.9%; and mean (SD) post-test percentage correct, 94.7% (8.7%); 95% CI 94.2% to 95.2%; $p < 0.001$)}, with an absolute percentage change of 17.6% (13.2%). Of the follow-up survey respondents, 92 of 132 (69.7%) reported completely implementing at least one clinical practice change, and only 8 of 132 (6.1%) reported inability to make any clinical practice change after the programme.

Bennett *et al.*[30] delivered a training video, a checklist or both to three intervention groups. At 1 year post intervention, there was significant improvement in the positive predictive value, adjusted for patient waiting time between GP referral and appointment at the ENT department. The improvement in positive predictive value pre and post intervention was 15% (95% CI –12.1 to 41.7) for the practices receiving

TABLE 4 Characteristics of GP education interventions delivered in one session

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Adams 2012[33]	One-day CME	BA	USA	COPD	351 primary care clinicians	(3–6 months)
Bennett 2001[30]	Video; checklist	cRCT	UK	ENT (glue ear)	50 practices 177 GPs	(1 year)
Donohoe 2000[31]	Practice visits; leaflets	cRCT	UK	Diabetic foot	10 towns 1939 patients Aged 18+ years	(6 months)
Kousgaard 2003[29]	Information pack to GPs on first referral	RCT (unblind)	Denmark	Oncology	248 patients 199 GPs	NR
Ramsay 2003[27]	Educational reminders on radiographs	RCT	Canada	Radiology (knee and spine)	81 GP practices 2324 referrals	12 months
Shariff 2010[28]	Educational module	Cohort	UK	Oncology (skin cancer)	460 referrals	15 months (12 months)
Watson 2001[32]	Practice education session ± information pack	cRCT	UK	Oncology (familial breast/ovarian cancer)	170 GP practices	9 months

BA, before-and-after; CME, continuing medical education; cRCT, cluster RCT; NR, not reported.

TABLE 5 Characteristics of GP education interventions delivered over many sessions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Bhalla 2002[37]	Three or four ENT sessions over a 2-week period once a year	Case control	UK	Otolaryngology (ENT)	Two GP practices 1073 referrals One partner in each GP practice	3 years
Ellard 2012[38]	Six 2-hour interactive sessions on common skin conditions	CBA	UK	Dermatology	30 GPs from 26 practices	(3 months)
Emmerson 2003[40]	Psychiatric appointments in primary care	Audit	Australia	Psychiatry	Five psychiatrists, 200 GPs	1 year
Hands 2001[34]	GPs trained at outpatient sessions	BA	UK	All specialties	22 consultants, 21 GPs	(6 months)
Hilty 2006[24]	**Regular CME peer review; consultation notes for GPs**	**BA**	**USA**	**Psychiatry**	**400 consultations**	**NR**
Lam 2011[25]	**Diploma in Community Geriatrics**	**CX**	**UK/China**	**Geriatrics**	**98 GPs**	**1 year**
Lester 2009[39]	Video, question and answer, two refresher sessions	cRCT	UK	Psychiatry	179 patients Two GP practices	(4 months)
Rowlands 2003[26]	**Educational referral meetings**	**CX (part of RCT)**	**UK**	**All specialists**	**13 GP practices** **Four or more partners**	**NR**
Suris 2007[35]	Biweekly educational sessions by specialists	BA	Spain	Rheumatology	117 GPs	1 year
Wolters 2005[36]	Distance-learning programme	RCT	Netherlands	Urology	142 GPs	(14 months)

BA, before-and-after; CBA, controlled before-and-after; CME, continuing medical education; CX, cross-sectional; NR, not reported.
Bold text indicates studies at higher risk of bias.

both interventions, compared with 20% (95% CI –32.9 to –6.4) for practices receiving only one intervention and a degradation of 34% for those receiving no intervention.

Donohoe *et al.*[31] delivered an educational intervention aimed at clarifying management of the diabetic foot, referral criteria and the responsibilities of professionals. The intervention included practice visits and education of the whole practice team. Leaflets outlining patients' role and responsibility were disseminated to the practices. Appropriate referrals from intervention practices to the specialist foot clinic rose significantly ($p = 0.05$), compared with control practices ($p = 0.14$).

Kousgaard *et al.*[29] provided a structured information pack to GPs when their patients attended the department of oncology for the first time. Intervention group practitioners gave a significantly higher score to the information value of the discharge letter than did control group practitioners. The most pronounced difference was seen for psychosocial conditions ($p = 0.001$) and information about what the patient had been told at the department ($p = 0.001$).

Ramsay *et al.*[27] reported that after 6 months of adding educational reminders to radiographs (adjusting for seasonal variation) the frequency of knee radiographs showed a relative risk (RR) reduction of 0.65 and lumbar spine radiographs showed one of 0.64. The mean number of referrals per practice per month for the control group was 2.97 (SD 3.22) knee and 2.88 (SD 3.05) spine, compared with intervention group mean referrals of 1.87 (SD 2.4) knee and 1.76 (SD 2.38) spine.

Watson *et al.*[32] randomised 170 practices to group A (receiving an in-practice educational session plus information pack), group B (receiving an information pack alone), or group C (receiving neither an educational session nor a pack). There was a 40% (95% CI 30 to –50, $p < 0.001$) improvement in the proportion of GPs who made the correct referral decision on at least five of six vignettes in group A (79%) compared with the control group (39%) and a 42% (95% CI 31 to 52%, $p < 0.001$) improvement in group B (81%) compared with the control group (39%). There was no significant difference between groups A and B.

A further 'one-session' intervention was not effective. Shariff *et al.*[28] delivered an educational module that was aimed at building confidence in the diagnosis of lesions not requiring an urgent referral, especially basal cell carcinomas and seborrhoeic keratoses, referred through the '2-week wait' route. After 11 months, the proportion of appropriately referred skin cancers (squamous cell carcinomas and melanomas) was 20.6%, compared with 23.2% before the intervention. The remaining 10 interventions were delivered over several sessions (see *Table 5*), although the exact number and timing of sessions was not always well described.

Hands *et al.*[34] reported an intervention where GPs attended outpatient sessions in different clinical specialties of their choice. GPs reported changes in their clinical behaviour which appear to have been maintained at 6 months. GPs stated that referral was discussed/taught in 83% of interactions. Immediately after the session, 25% of GPs reported that this would change their referral behaviour. After 6 months, 29% reported behaviour change in reference to referral.

Hilty *et al.*[24] implemented the following educational strategies. (1) Regular continuing medical education lectures. (2) GP participation in consultations: GPs present their patients at the beginning of the sessions, and get direct feedback at the end. (3) Consultation notes for GPs: a note by the psychiatrist was sent within 10 minutes of each consultation in a deliberately educational style. A dictation of two to three pages was sent in about 5 working days. (4) Telephone consultations with the psychiatrist. Among the first 200 consultations, only 47.4% of the medication doses for depressive and anxiety disorders were adequate, according to national guidelines. Among the second 200 consultations, dosing adequacy improved to 63.6% ($p < 0.001$). GPs rated the quality of consultation as significantly higher over time (95% CI 4.45 to 4.83, $p < 0.001$), as with overall satisfaction (95% CI 4.49 to 4.73, $p < 0025$). This study was considered to be at higher risk of bias.

Suris *et al.*[35] carried out biweekly educational sessions with GPs for 1 year (a total of 120 sessions carried out by four rheumatologists). At the end of the pilot year the total number of GP referrals was 31% lower than the previous year (1141 vs. 1652, no significance levels reported). The referral rate to the rheumatology unit decreased significantly from 8.13 per 1000 to 5.53 per 1000 (2.6, 95% CI 2.09 to 3.10; $p < 0.001$).

Wolters *et al.*[36] delivered a distance-learning programme accompanied with educational materials or a control group only receiving mailed clinical guidelines. The distance-learning programme comprised: (1) a package for individual learning developed by the Dutch College of General Practitioners; (2) consultation supporting materials: a voiding diary, the international prostate symptom score (IPSS) and Bother score; (3) the guideline summarised into two decision trees [one on clinical management of lower urinary tract symptoms (LUTS) and one on prostate-specific antigen (PSA) testing] and a brief explanation; and (4) two information leaflets for patients (on PSA testing and on treatment for LUTS). The intervention group showed a lower referral rate to a urologist [odds ratio (OR) 0.08, 95% CI 0.02 to 0.40], but no effect on PSA testing or prescription of medication.

Six further studies delivered over several sessions did not show a clearly positive effect on referral outcomes. Four of these were at lower risk of bias: Bhalla *et al.*[37] delivered three or four clinical ENT sessions over a 2-week period, once a year for 3 years to one partner in a GP practice. There was no statistical difference in referral rates (Kruskal–Wallis: $p = 0.63$) for the trained partner when compared with the other three partners in the same practice. There was also no statistical difference in referral patterns between the intervention and the control practice (Mann–Whitney *U*-test $p = 0.50$).

Ellard *et al.*[38] completed six 2-hour interactive sessions on common skin conditions in early 2011. Appropriate referrals from participants increased from 37.2% in 2010 to 51.8% after training, accompanied by an increase in the mean number of referrals from 20.7 to 25.7. Furthermore, the overall number of appropriate referrals increased from 37.8% to 49.5% at participating surgeries. However, these results were compared with the 36 other local GP practices that did not participate in the training programme, which also displayed an increase in appropriate referrals from 40.8% to 56.4% from 2010 to 2011.

Lester *et al.*[39] reported an intervention consisting of a 17-minute video, a 15-minute question-and-answer session, and two refresher educational sessions conducted over 4 months. Ninety-seven people with a first episode of psychosis were referred by intervention practices and 82 people from control practices during the study: RR of referral 1.20 (95% CI 0.74 to 1.95, $p = 0.48$). No effect was observed on secondary outcomes except for 'delay in reaching early-intervention services', which was statistically significantly shorter in patients registered in intervention practices (95% CI 83.5 to 360.5, $p = 0.002$).

Emmerson *et al.*[40] developed a psychiatric assessment and advisory service for local GPs. Five full-time psychiatrists dedicated a 1-hour appointment per week in their hospital private practice clinics to assess patients referred by local GPs. After 12 months referrals to the clinic were disappointing ($n = 30$, with 10 referrals from one GP). Feedback from GPs who had used the service showed high levels of satisfaction with the service (mean score 6.2 out of 7). Feedback from GPs who had not used the service showed a strong endorsement of the concept (94%), but there was poor awareness of the service's existence (26%).

There were also two studies of interventions delivered over several sessions which were at higher risk of bias. Lam *et al.*[25] conducted an evaluative study to examine the impact of a 1-year part-time Postgraduate Diploma in Community Geriatrics. The diploma includes the components of clinical attachment (20 sessions of clinical geriatric teaching and five sessions of rehabilitation and community health services), interactive workshops, locally developed distance-learning manual, written assignments and examination as well as a clinical examination. Most respondents did not refer elderly patients to private geriatricians and would refer them to public geriatricians or other specialists. After the course, the average percentage of elderly patients being referred to private geriatricians increased from 2.8% to 6.1% and to other specialists decreased from 53.4% to 49.1%. The changes in the referrals to private geriatricians and other specialists were

statistically significant. However, no significant change was found in the referrals to public geriatricians. The average percentage remained around 44%. It is unclear which of those outcomes were beneficial or how this study could be applied in a UK context.

Finally, Rowlands *et al.*[26] implemented an educational intervention consisting of referral meetings. Fewer than half of doctors became involved with development of formal referral or clinical protocols. Eighty-eight per cent noted a change in their referral practice. Overall, there was no change on referral rate in the intervention group. This study was considered to be at higher risk of bias.

Guidelines (no training or feedback)

Interventions that consisted of guidelines mailed to GPs (with no further training, support or feedback) were reported in 12 studies (*Table 6*).[41–52] The guidelines were for a range of referral conditions and procedures including genetic screening, orthopaedics, complications of diabetes, dementia, dermatology (two studies[43,49]), radiography (two studies[42,50]) and cancer (three studies[41,46,47]). Overall, seven studies reported at least some positive impact on referral,[41–47] with five showing no effect or a negative change.[48–52] Two of the positive impact studies were considered to be at higher risk of bias[41,42] with all other studies at lower risk of bias. Overall, the strength of this evidence was graded as inconsistent.

Seven studies showed a positive effect on at least one referral outcome (although results were often borderline or mixed). Five of these studies were considered to be at lower risk of bias.

Cusack and Buckley[43] analysed dermatology referral letters from GPs prior to guidelines and 60 following guideline introduction. NICE guidelines and a pro forma for future referrals were sent to GPs. The percentage of referrals in accordance with NICE guidelines increased from 31% to 45% after introduction of guidelines ($p = 0.041$). The percentage of inappropriate referrals decreased from 69% to 55%, and 22% of GPs (8 of 36) fully complied with guidelines. However, over 50% of referrals were still inappropriate. The pro forma was used in only 23% of referrals and the provision of data in referral letters remained poor. The number of referrals per month only marginally decreased.

Idiculla *et al.*[44] analysed 200 GP referral letters submitted before (set 1) and 200 submitted after (set 2) local guidelines on the management of adult diabetes had been issued to local GPs. Following the distribution of the guidelines there was no significant change in the frequency with which specific conditions were documented in referral letters (set 1 vs. set 2): for example, hypertension 72% versus 79%, cerebrovascular disease 89% versus 80%. However, the guidelines did appear to have encouraged the active treatment of hyperglycaemia by GPs before referral.

Lucassen *et al.*[45] sent referral guidelines for a regional genetics service family cancer clinic to GPs and subsequent content of referral letters was analysed and compared with the previous 6 months. Post guidelines, more referrals met the criteria than before ($\chi^2 = 15.79$, $p < 0.001$). Fewer lower-risk referrals were made: 34% of letters (36/103) were high risk pre guidelines, whereas 47% (46/110) were high risk post guidance (not significant: χ^2 for change in proportion of low risk pre and post = 1.34; $p = 0.24$, and for high risk $\chi^2 = 3.33$, $p = 0.07$). The description of the risk in the GP letter improved so that a greater proportion of generic clinic risks agreed with those described in the GP letter.

Potter *et al.*[46] used routine data to consider the effect of the introduction of the 2-week wait guideline for cancer referrals. The annual number of referrals increased over 7 years from 3499 in 1999 to 3821 in 2005, a significant increase of 1.6% (95% CI 1.0% to 2.2%). The number of 2-week wait referrals increased by 42% ($n = 739$) from 1751 in 1999 to 2490 in 2005, an estimated increase of 5.8% per year (5.0% to 6.7%, $p = 0.001$). By contrast, the number of routine referrals has declined over the same period by an estimated 4.3% a year (3.3% to 5.2%, $p < 0.001$), giving an apparent reduction of 24% ($n = 417$) from 1999 to 2005. The percentage of patients diagnosed with cancer in the 2-week wait group decreased from 12.8% (224/1751) in 1999 to 7.7% (191/2490) in 2005 ($p < 0.001$), whereas the number of cancers detected in the 'routine' group increased from 2.5% (43/1748) to 5.3% (70/1331) ($p < 0.001$)

TABLE 6 Characteristics of guideline dissemination interventions (no training or feedback)

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Cusack 2005[43]	NICE guidelines and a pro forma	BA	UK	Dermatology	36 GPs 150 referrals	(18 months)
Fearn 2009[48]	QOF Depression Indicators	BA	UK	Dementia clinic	NR	(18 months)
Hill 2000[49]	Local guidelines	Audit	UK	Dermatology	33 GP practices 422 patients	(2 years)
Idiculla 2000[44]	Local guidelines	RCT	UK	Outpatient infertility clinic	214 GP practices 689 referrals Most aged over 34 years, 84% female only	1 year
Imkampe 2006[47]	Pro forma for breast cancer referral	BA	UK	Oncology (breast cancer)	2354 referrals	(8 months)
Lucassen 2001[45]	Local guidelines	BA	UK	Regional genetics service	NR	14 months (6 months)
Malik 2007[41]	**2-week wait cancer guidelines**	**Audit**	**UK**	**Oncology (bone or soft tissue tumour)**	**40 patients**	**2 years**
Matowe 2002[50]	Royal College of Radiology referral guidelines	BA	UK	Radiology	376 GPs in 87 practices 117,747 referrals	(3 years)
Melia 2008[51]	Prostate Cancer Risk Management Programme guidelines	BA	UK	Urology	200 GP partners in 48 practices Male patients aged 45–84 years, $n = 1520$	1–2 years
Potter 2007[46]	2-week wait cancer guidelines	Cohort	UK	Oncology (breast cancer)	24,999 new referrals	(7 years)
Twomey 2003[42]	**Local guidelines**	**BA**	**UK**	**Radiology**	**NR**	**2 years**
West 2007[52]	Local guidelines	BA	UK	Orthopaedic outpatient department	471 referrals	29 weeks

BA, before-and-after; QOF, Quality and Outcomes Framework.
Bold text indicates studies at higher risk of bias.

over the same period. About 27% (70/261) of people with cancer are currently referred in the non-urgent group. Waiting times for routine referrals have increased with time.

Imkampe *et al.*[47] determined whether or not GP grading of referrals into urgent and non-urgent had improved after the introduction of the 2-week rule was introduced. A retrospective review of GP referrals over 8 months, between September 2003 and April 2004, with regard to their urgency, subsequent diagnosis and the use of standardised referral formats was carried out. The results were compared with the 1999 audit. Eighty-two of 1178 patients referred by GP had breast cancer versus 115 of 1176 patients referred in 1999. Sixty-eight per cent (56/82) of breast cancer patients were referred as urgent, compared with 47% (54/115) in 1999 ($p = 0.005$). A pro forma was used in 47% (548/1178) of GP referrals, while no pro forma was used in 1999. Sixty-five of the 82 cancer patients were referred with a pro forma and 85% (55/65) were referred as urgent.

Two further studies which showed a positive effect on at least one referral outcome were at higher risk of bias. Malik *et al.*[41] determined if the 2-week wait referral guidelines for suspect cancer referrals had been followed and what proportion of patients referred under the guideline had malignant tumours. Referral letters were evaluated to see if they met Department of Health guidelines for referral of a suspected bone or soft tissue tumour. Most (31 of 40: 78%) '2-week' referrals met the published referral guidelines. However, in 9 of the 40 cases, the patient did not meet the criteria for urgent referral, and none of the nine patients had malignant tumours. Of 40 patients referred under the guideline, 10 of these patients (25%) had malignant tumours, but this was compared with 243 of 507 (48%) of those referred from other sources. Twomey[42] assessed GP referral for plain radiography in the areas of hip, knee, cervical spine and lumbar to establish a procedure for the development of care pathways. The proposed guidelines were circulated to all GPs. GP referrals to radiology for plain radiography declined from 2365 the year before the intervention to 1077 the year after intervention, a total reduction of 288 (54%). Similarly, referrals for plain radiography requests declined from 6650 to 4291, a reduction of 2359 (35.5%).

Five further studies (all at lower risk of bias) of dissemination of referral guidelines showed no effect, or a negative effect, on referral outcomes.

Fearn *et al.*[48] looked at whether or not the introduction of Quality and Outcomes Framework (QOF) Depression Indicators changed the pattern of referrals from primary care to a dedicated dementia clinic. The percentage of all referrals originating from primary care was about half in both time periods and did not differ significantly between the two time periods ($\chi^2 = 0.88$, df = 1, $p > 0.1$; $z = 0.77$, $p > 0.05$). Of the referrals from primary care, about one-third referred in both time periods had dementia. The RR of a diagnosis of dementia in a primary care referral pre and post QOF was 0.55 (95% CI 0.40 to 0.74) and 0.66 (95% CI 0.49 to 0.89), respectively. The proportion of patients referred from primary care with dementia was the same in the cohorts seen both before and after introduction of the QOF Depression Indicator ($\chi^2 = 0.54$, df = 1, $p > 0.05$), a finding corroborated by the *z*-test ($z = 0.60$, $p > 0.05$).

Hill *et al.*[49] evaluated referral guidelines for dermatology compiled by the dermatologist at the Royal Surrey County Hospital in consultation with local GPs. A 40% increase was seen in the numbers of referrals recorded by the dermatologist as appropriate immediately after the guidelines were sent (from 57% to 80%). The 2-year follow-up audit, however, demonstrated that the improvement had not been sustained, with a decline to 48% appropriate referrals.

Matowe *et al.*[50] mailed copies of the Royal College of Radiology referral guidelines for chest, limb and joint, and spine radiographs to GPs. There were no significant effects of the intervention on total number of general practice imaging requests. Total referrals decreased by 32 (95% CI –226.7 to 291.4) in the month following guideline dissemination, while the trend decreased by –1.82 requests per month (95% CI –11.8 to 8.2 requests per month). Referral only decreased by average 1.2 per month for the entire 35-month period.

Melia *et al.*[51] disseminated the Prostate Cancer Risk Management Programme (guidelines for GPs on age-specific PSA cut-off levels in asymptomatic men). One year after intervention, awareness of the pack was acknowledged by 112 (56%) GPs (24 were unaware and 64 did not know if they had seen it). The proportion of asymptomatic men referred who had raised antigen levels did not increase significantly from baseline to intervention (24% pre intervention, 29% post intervention; $p = 0.42$) There was no significant difference in referral rate by area ($p = 0.33$).

West *et al.*[52] completed a 13-week audit of referral letters for six specific orthopaedic complaints, namely anterior knee pain, back pain, carpal tunnel syndrome, in-toeing in children, sciatica and tennis elbow. Paper copies of referral guidelines produced by orthopaedic consultants were distributed to all local GPs. After a period of 4 weeks for distribution, the process was repeated for a further 13 weeks. The first 13-week period had 195 (64%) referrals that consisted of patients who had not received the recommended management or to whom this had not been mentioned in the referral letter. The second period had 103 (61%). There was no statistically significant difference between the two ($p = 0.49$).

Guidelines with additional training or feedback

Interventions consisting of guidelines with additional training or feedback were reported in 18 studies (all lower risk of bias), of which 11 showed a positive association with referral outcomes[53–63] and six did not (*Table 7*).[64–69] The guidelines were for a range of referral conditions and procedures including mental health, infertility clinic, dermatology, gynaecology, oncology, colorectal surgeon, urology, cardiology (two studies[56,63]), low-back pain (two studies[66,87]), endoscopy (two studies[53,55]) and radiology (four studies[54,57,59,60]).

Eleven studies showed a positive relationship between the intervention and referral-related outcomes.[53–63]

Banait *et al.*[53] implemented educational outreach as a strategy for facilitating the uptake of dyspepsia management guidelines in primary care for open-access endoscopy. All groups received the guidelines by post and the intervention groups began to receive education outreach 3 months later. The outreach included practice-based seminars with hospital specialists at which guidelines recommendations were appraised and implementation plans formulated, and was reinforced by visits after 12 weeks. The proportion of appropriate referrals was higher in the intervention group in the 6-month post-intervention period (practice medians: control = 50%, intervention = 63.9%; $p < 0.05$). The proportion of major findings at endoscopy did not alter significantly, but there was an overall rise in acid-suppressing drugs in the intervention, compared with the control group (+ 8% vs. + 2%, $p = 0.005$).

Eccles *et al.*[54] compared two methods of reducing GP requests for radiological tests in accordance with the UK Royal College of Radiologists' guidelines on lumbar spine and knee radiographs. GPs and consultant radiologists wrote referral guidelines and educational messages for lumbar spine and knee radiographs [based on the Royal College of Radiologists' guidelines and the Royal College of General Practitioners' (RCGP) back-pain guidelines]. The referral guidelines were then sent by post to all study GPs. Each practice was randomly allocated to receive audit and feedback or control; and educational messages or control. Feedback covered the previous 6 months' referrals and was sent to GPs at the start of the intervention period and 6 months later. Educational messages were attached to the reports of every knee or lumbar spine radiograph requested during the intervention. The effect of educational reminder messages (i.e. the change in referral rate after intervention) was an absolute change of 1.53 (95% CI 2.5 to 0.57) for lumbar spine and of 1.61 (2.6 to 0.62) for knee radiographs (relative reductions of ≈20%). The effect of audit and feedback was an absolute change of 0.07 (1.3 to 0.9) for lumbar spine and 0.04 (0.95 to 1.03) for knee radiograph requests (relative reductions of 1%). Requests from doctors who had received audit and feedback were no more likely to be appropriate than requests from other doctors: OR 0.75 (95% CI 0.52 to 1.07) for lumbar spine radiographs and 0.82 (0.50 to 1.33) for knee. For doctors who had received educational reminder messages, the equivalent values were 0.95 (0.63 to 1.67) and 1.36 (0.86 to 2.23).

TABLE 7 Characteristics of guideline dissemination interventions with additional training or feedback

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Banait 2003[53]	Educational outreach/dyspepsia management guidelines	cRCT	UK	Open-access endoscopy (GI)	114 practices 233 GPs	(6 months)
Dey 2004[66]	RCGP guidelines plus outreach visits	cRCT	UK	Low-back pain	24 health centres 2187 patients; age 18–64 years (mean 42.2 years, SD 12.1) 54% female	(8 months)
Eccles 2001[54]	RCGP guidelines, audit and feedback, or educational messages	RCT	UK	Radiology	Six radiology departments; 244 general practices	(1 year)
Elwyn 2007[55]	NICE guidelines plus feedback	BA	UK	Endoscopy (dyspepsia)	215 GPs Three endoscopy units	(5 months)
Engers 2005[67]	National guidelines plus workshop	cRCT	the Netherlands	Low-back pain	41 GPs 531 patients	NR
Glaves 2005[57]	Guidelines plus return of referrals	BA	UK	Radiology (spine and knee)	Three community hospitals	(1 year)
Griffiths 2006[58]	Local guidelines and training sessions	cRCT	UK	Dermatology	165 health centres Patients 18+ years with psoriasis $n = 188$	NR
Jiwa 2006[68]	Local guidelines plus visit	cRCT	UK	Colorectal surgeon	44 practices 180 GPs 504 patients GPs 30–60 years	(6 months)
Julian 2007[62]	Shared care guidelines	nRCT	UK	Gynaecology	193 GP practices One hospital	(8 months)
Kerry 2000[59]	Royal College of Radiology guidelines plus feedback	RCT	UK	Radiology (spinal exam)	69 GP practices	2 years (9 months)
Morrison 2001[64]	Local guidelines plus meeting	RCT	UK	Outpatient infertility clinic	214 GP practices 689 referrals Age 34+ years 84% female	1 year

continued

TABLE 7 Characteristics of guideline dissemination interventions with additional training or feedback (*continued*)

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Robling 2002[60]	Local guidelines plus seminar or newsletter	RCT	UK	Radiology (MRI)	121 GP practices 182 referrals	NR
Spatafora 2005[69]	Local guidelines plus meeting	BA	Italy	Urology (outpatients)	45 urological centres, 263 GPs GPs' mean age 47 years 18% female	NR
Walkowski 2007[63]	Local guidelines, telephone call, e-mail, or in-person visit	cRCT	USA	Cardiology	Five US states	15 months (3 months)
White 2004[61]	Local guidelines plus implementation strategy	Audit	UK	Mental health	NR	(2 years)
Wilson 2006[65]	Local guidelines plus education meetings and outreach	cRCT	UK	Oncology (familial breast cancer)	GP in Grampian	4 years (11 months)
Wright 2006[56]	Guidelines, educational meetings, outreach visits	CBA	UK	Cardiology (post TIA for stroke prevention)	One PCT	50 months (22 months)

BA, before-and-after; CBA, controlled before-and-after; cRCT, cluster RCT; GI, gastrointestinal; MRI, magnetic resonance imaging; NR, not reported; PCT, primary care trust; RCGP, Royal College of General Practitioners; TIA, transient ischaemic attack.

Elwyn *et al.*[55] evaluated a system of providing feedback to clinicians following referral requests not adhering to NICE guidelines. Letters were sent to GPs stating that two GPs would be employed part-time to assess all endoscopy letters and referrals for dyspepsia and they would be judged against recently issued NICE guidelines. Where referrals did not meet the criteria, the referring doctor would be informed by letter giving a reason for non-adherence to guidelines. The All Wales Dyspepsia Guidelines based on NICE criteria were circulated to GPs 2 weeks earlier. Adherence to NICE guidelines for referral criteria increased significantly among GPs following the intervention (mean 55% to 75%; 95% CI 13.6 to 26.4; $p < 0.001$). No similar effect was seen for hospital doctors. The number of gastroscopy referrals for dyspepsia declined after the intervention, but not significantly after inclusion of seasonal effects ($p = 0.065$). Intervention significantly reduced the referral to procedure time for gastroscopy (mean 52.1 to 39.4 days, 95% CI 6.6 to 18.6 days; $p < 0.001$).

Wright *et al.*[56] completed an evaluation of a quality improvement programme for transient ischaemic attack (TIA) referral in three primary care trusts (PCTs). Four local consensus group meetings for relevant stakeholders (including service users and carers) were used to adapt national guidelines to local context and identify barriers and incentives for changing practice. Guideline reminders for clinicians included laminated posters, desktop coasters and electronic referral templates. Guidelines were disseminated via education meetings in each PCT and further education outreach visits to 19 practices. Guidelines were disseminated by post to other practices not requesting a visit. There was a 41% increase in referrals from trained practices, compared with control practices (RR 1.41, $p = 0.018$). Adherence to best-practice standards was significantly higher in practices that had received the training programme than in the controls.

Glaves[57] undertook an intervention where GPs referring to three community hospitals and a district general hospital were circulated with referral guidelines for radiography of the cervical spine, lumbar spine and knee. All requests for these three examinations were checked and requests that did not fit the guidelines were returned to the GP with an explanatory letter and a further copy of the guidelines. If the GP maintained the opinion that the examination was indicated, they had the option of supplying further information in writing or speaking to a consultant radiologist to reach agreement. The total number of examinations fell by 68% in the first year (95% CI 67% to 69%) and 79% in the second year (95% CI 78% to 80%). Knee radiographs fell by 64% in the first year (95% CI 62% to 65%) and 77% in the second year (95% CI 75% to 79%). Lumbar spine radiographs fell by 69% in the first year (95% CI 68% to 71%) and 78% in the second year (95% CI 77% to 80%). Cervical spine radiographs fell by 76% in the first year (95% CI 74% to 78%) and 86% in the second year (95% CI 84% to 88%) ($p = 0.001$ for all measures).

Griffiths *et al.*[58] evaluated the effectiveness of guidelines and training sessions on the management of psoriasis in reducing inappropriate referrals from primary care. Guidelines on the management of psoriasis in primary care, developed by local dermatologists, were sent to health centres in the intervention arm, and supplemented by the offer of a practice-based nurse-led training session. Patients in the intervention arm (82/105) were significantly more likely to be appropriately referred than patients in the control arm (49/83), a difference of 19.1% [OR 2.47; 95% CI 1.31 to 4.68; intracluster correlation coefficient (ICC) 0]. Only 25 (30%) health centres in the intervention arm took up the offer of training sessions. There was no significant difference in outcome between health centres in the intervention arm that received a training session and those that did not (OR 1.28, 95% CI 0.50 to 3.29; ICC 0).

Kerry *et al.*[59] evaluated the introduction of radiological guidelines into general practices, together with feedback on referral rates, to see whether or not this reduced the number of GP radiological requests over 1 year. A GP version of the Royal College of Radiologists guidelines was sent to each GP in the 33 practices in the intervention group. Guidelines for examination of chest, hips, knees, spine, skull and sinuses were printed verbatim on two sides of a sheet of A4 paper, which was then laminated. After 9 months' intervention, practices were sent revised guidelines with individual feedback on the number of examinations requested in the past 6 months. A total of 43,778 radiological requests were made during the 2-year intervention. The number of referrals for all spinal examinations fell by 18% in the intervention group, compared with a 2% rise in the control group ($p = 0.05$). Taking requests for the lumbar spine alone, there was a reduction of 15% in the intervention group, compared with a rise of 5% in the control group, giving a difference of 20% between the groups (95% CI 3% to 37%). Overall, an 8% reduction in total numbers of radiological requests was observed in the intervention group, compared with a 2% increase in the control group (10% between the two groups, not significant).

Robling *et al.*[60] investigated whether or not method of access or method of guideline dissemination affects GP compliance with referral guidelines for magnetic resonance imaging (MRI) in two sequential trials: (1) one group of practices requesting MRI by telephone was compared with a second group requesting in writing using a standard request form. A third group could refer as wished; and (2) one group of practices receiving guidelines via a seminar was compared with a second group who received feedback via a newsletter with practice-specific data on referrals. A third group received both a seminar and feedback, and a fourth group received guidelines only by post. The seminars were facilitated by an academic GP and a researcher. In trial 1, 65% of requests were judged to be compliant with the guidelines and there were no statistical differences between the three groups. Telephone access proved unpopular among participants and written access more cost-effective. In trial 2, 74% of referrals were judged to be compliant with the guidelines and there was no association between method of dissemination of guidelines and compliance. Requests made after dissemination of guidelines were more likely to be compliant: 74% versus 65% (OR 1.62, $p < 0.005$).

White *et al.*[61] aimed to use guidelines to improve communication between GPs and community mental health teams (CMHTs). Following a baseline audit of referrals and assessment letters, locally agreed good practice protocols were developed and shared widely, accompanied by a dissemination and implementation strategy (updates at 6-monthly intervals throughout the project). Significant improvements occurred in both the GP and the CMHT letters. These were most dramatic after 1 year but tailed off considerably in the second year despite continued efforts to implement the protocol's standards. Annual GP referrals (percentage of total) reduced from 661 (63%) to 550 (58%), *p*-value not significant, and new referrals completing CMHT assessment increased from 369 (66%) to 423 (89%) ($p < 0.001$).

Julian *et al.*[62] examined the outcomes of an integrated model. Women attending the new 'Bridges' pathway were compared with those attending a consultant-led one-stop menstrual clinic. The Bridges pathway involved the use of shared care evidence-based guidelines for the management of dysmenorrhoea patients in primary and secondary care, which determined the timings for investigations and surgical treatment. Management decisions were made by GPs in all but atypical/complex cases. At 8 months, there were no significant differences between the groups in terms of surgical and medical treatments of in the use of GP clinic appointments. Significantly fewer hospital outpatient appointments were made in the Bridges group than in the one-stop menstrual clinic ($p < 0.001$). Patient diaries demonstrated a significant improvement in the Bridges group for patient information, ease of access ($p < 0.001$), choice of doctor ($p < 0.002$), waiting time ($p < 0.001$) and less 'limbo' between primary and secondary care ($p < 0.001$).

Walkowski *et al.*[63] tested the effect of different strategies to inform GPs of the high performing cardiac specialists in their community and facilitate increased referrals to these specialists. This initiative involved sending letters to primary care physicians which requested that when the physician had a patient needing referral to a cardiac specialist or facility, they refer that patient to a physician or facility that had earned the 'United Health Premium designation for both Quality and Efficiency of care'. To facilitate those referrals, the primary care physicians were provided with a hard-copy referral list of cardiac specialists and hospitals. Participants were divided into four test groups: (1) letter and referral list (LRL) only ($n = 3537$); (2) LRL plus follow-up telephone call from the local health plan ($n = 252$); (3) LRL plus e-mail reminder ($n = 1187$); or (4) LRL plus in-person follow-up visit from the local market medical director ($n = 65$). The initial 3-month pilot data showed an overall 6.3% increase of patients referred to United Health Premium-designated quality and efficient cardiac specialists overall, compared with a baseline period of 12 months prior to the mailing. Intervention effects ranged from 17% change (letter plus call) to 22% change (letter plus visit), versus 0.3% change in the control group. The applicability of this study in the UK may be limited.

Six further studies (all at lower risk of bias) of dissemination of referral guidelines with additional support or training showed no effect or a negative effect on referral outcomes.[64–69]

Morrison *et al.*[64] evaluated the effect of clinical guidelines on the management of infertility in general practice. Local guidelines were developed and a management pack was sent to intervention practices with an invitation to attend a meeting to discuss using the guidelines. Seventeen per cent of doctors attended a meeting. Individual visits were also offered but were taken up by only two practices. There was no difference between the control and intervention practices with regard to whether or not a management plan was made (OR 1.239, 95% CI 0.869 to 1.765; $p = 0.236$). There was also no difference in duration between first appointment and date of management plan, no difference in mean number of outpatient visits before a management plan was put in place, and no significant difference in total costs to the NHS (£349.78 vs. £327.48, $p > 0.05$).

Wilson *et al.*[65] considered the effectiveness of an intervention to improve GP confidence in managing patients concerned about genetic risk of breast cancer. Components of the intervention software included a list of the key patient information needed in order to use the guidelines. A risk assessment module was presented as a set of short checklists, in which the Scottish referral guidelines for breast, ovarian and colorectal cancer were embedded. This was provided along with the following: background information on cancer genetics

and the evidence underlying the guidelines (prepared by local geneticists); printer-ready, locally customised patient information leaflets; selected web-links for professionals and patients; and a contact e-mail link with the Cancer Genetics Service, with a guaranteed response time. The system automatically produced a draft referral letter using the regionally recommended template. All partners in intervention practices were invited to interactive workshops on cancer genetics designed to complement the software. No statistically significant differences were observed between intervention and control arms in the primary or secondary outcomes. Only a small proportion of intervention GPs attended the educational session, were aware of the software or made use of it in practice. In the pre-intervention period, intervention GPs were less likely than control GPs to refer patients who were eventually assessed as having elevated genetic risk (0.70, 95% CI 0.50 to 0.99), with the opposite trend observed in the post-intervention period (1.18, 95% CI 0.88 to 1.37), although these results did not reach statistical significance.

Dey *et al.*[66] evaluated the impact on patient management of an educational strategy to promote the RCGP's low-back-pain guidelines among GPs. Practices in the intervention arm were offered outreach visits to promote national guidelines on acute low-back pain, as well as access to fast-track physiotherapy and to a triage service for patients with persistent symptoms. At least two members of the guideline team attended each visit; these included senior representatives from the musculoskeletal directorate, physiotherapy services and the health authority. Members of the guideline team facilitated a structured interactive discussion with the GP to raise awareness of the RCGP guidelines, adapted to the local context; emphasise the key messages in the guidelines; identify potential barriers to implementation; and suggest strategies for overcoming the barriers identified. GPs were given a poster reinforcing guideline recommendations and a copy of a text recommended by the RCGP for patients. The estimated annual consultation rate for acute low-back pain was 35 per 1000 adults in the intervention group, compared with 38 per 1000 in the control group. There were no significant differences between study groups with respect to the proportion of patients who were referred for radiography (a difference of 1.4%, 95% CI –4.1% to 6.8%), issued with a sickness certificate (a difference of –1.5%, 95% CI –10.3% to 7.3%), prescribed opioids or muscle relaxants (a difference of –0.03%, 95% CI –5.5% to 5.4%) or referred to secondary care (a difference of 1.1%, 95% CI –0.3% to 2.6%). Significantly more patients in the intervention group were first referred to physiotherapy or to educational programmes at the back pain unit than in the control group (a difference of 12.2%; ICC = 0.0563; $\chi^2 = 6.49$; 1 df; $p = 0.01$; 95% CI 2.8% to 21.6%).

Engers *et al.*[67] assessed the effectiveness of the Dutch low-back-pain guideline for GPs with regard to adherence to guideline recommendations. GPs in the intervention group received a tailored interventions consisting of the Dutch low-back-pain guideline for GPs, a two hour educational and clinical practice workshop; two scientific articles on low-back-pain management; the guideline for occupational physicians; a tool for patient education; and a tool for reaching agreement on low back care with physical, exercise and manual therapists. The participating GPs were asked to recruit consecutive patients with a new episode of low-back pain as the main reason for consultation. The intervention was delivered by a psychologist-physiotherapist. Forty-one of the 67 randomised GPs reported on a total of 616 consultations for 531 patients with non-specific low-back pain. The advice and explanation provided by the GPs, the prescription of paracetamol (33% vs. 21%) or non-steroidal anti-inflammatory drugs (54% vs. 62%), and prescription of pain medication on a time contingent (70% vs. 69%) or a pain contingent basis (30% vs. 31%), showed no statistically significant differences between the intervention and control groups. There were also no differences in overall referral rate (23% vs. 28%; OR 0.8, 95% CI 0.5 to 1.4). However, in follow-up consultations fewer patients were referred to a physical or exercise therapist by the GPs in the intervention group than in the control group (36% vs. 76%; OR 0.2, 95% CI 0.1 to 0.6).

Jiwa *et al.*[68] evaluated a referral guideline intervention for lower bowel symptoms. GP practices were offered one of an electronic interactive referral pro forma, an educational outreach visit by a local colorectal surgeon, both or neither. They developed and piloted an interactive electronic pro forma for processing referrals to colorectal surgeons (General Practice Referral Assessment Facilitator or G-RAF). The interactive pro forma requested information on drop-down menus for 15 clinical signs and symptoms

previously identified by GPs and colorectal surgeons as those of significant colorectal disease. The interactive software offered the practitioner guidance on which cases needed urgent referral with reference to current UK Department of Health guidelines. A referral letter was automatically produced seeking an appropriate appointment at a hospital clinic. The educational outreach visit was delivered by a colorectal surgeon. During the 45-minute meeting, the presenter summarised the features of significant organic colorectal disease and encouraged questions. There were 716 consecutive referrals recorded over a 6-month period, for which a diagnosis was available for 514. There was no significant difference in proportion of cases with significant pathology for either intervention or compared with no intervention. In the combined software arms 14% (37/261) had significant pathology, compared with 19% (49/253) in the non-software arms: RR 0.73 (95% CI 0.46 to 1.15). In the combined educational outreach arms 15% (38/258) had significant pathology, compared with 19% (48/256) in the non-educational arms (RR 0.79, 95% CI 0.50 to 1.24).

Spatafora *et al.*[69] developed a short algorithm on procedures to be used with men with LUTS. The algorithm was developed by urologists and approved by a panel of experts. It was presented at a meeting with local GPs and revised in line with feedback, and the revised protocol was presented at each centre. The protocol was a clinical report form containing history, examination, use and outcome of tests, and diagnosis. Sixteen per cent of centres accepted the original protocol with no changes. There was no significant change in referral pattern from baseline to intervention: 51.2% of patients were managed entirely by their GP, 44.3% were referred to urologist after some diagnostic procedures and 4.5% were referred without any diagnostic testing. Use of digital rectal exams increased significantly from 32% to 41% ($p < 0.001$) and this was predominantly in centres that endorsed this test.

Process change interventions

We defined process changes as small-scale changes to some aspect of the individual referral process which did not involve the movement of staff or relocation of clinics, the methods in which referrals were triaged at hospital or financial arrangements for referral.

Process change interventions included designated appointment slots and fast-track clinics for primary care referrals ($n = 6$), interventions that provided direct access to screening ($n = 9$), specialist consultation prior to referral ($n = 11$), electronic referral systems ($n = 10$), the provision of decision support tools to assist GPs in making referrals ($n = 10$) and interventions that consisted of waiting list review or watchful waiting ($n = 3$).

Designated slots/fast-track clinics

The provision of designated appointment slots and fast-track clinics for primary care referrals were reported in six studies (*Table 8*).[70–75] The speed of referral varied from the same day to within 2 weeks (to meet the 2-week cancer referral guidelines). Four studies showed a positive effect,[70–73] with two studies showing a negative or no effect.[74,75] One effective study was considered to be at higher risk of bias.[72] The evidence overall was rated as inconsistent.

Bridgman *et al.*[70] evaluated a slot system for referrals. GPs and orthopaedic consultants were invited to a meeting to discuss and input into the design of the system. The number of slots available was based on the registered practice population. Quota of slots and their use was fed back to practices on a monthly basis. If a practice went beyond their quota they were told that they might not be allowed to refer any more patients that month. GPs guaranteed a maximum of 8 weeks' assessment for patients and the backlog of waiting patients was removed. GPs received guidelines on appropriate referrals and routes of referrals for musculoskeletal problems. A clerical officer was appointed to answer queries and make appointments. After a modification to the hospital software, referrals were made using a special pro forma, which included a prioritisation score. In total, 15,439 referrals were made, and 90% attended their

TABLE 8 Characteristics of fast-track interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Bridgman 2005[70]	Quota appointment slots	CBA	UK	Orthopaedic (outpatients)	36 practices 33 GPs 30 full-time Three single practices	(18 months)
Hemingway 2006[73]	Protocol-driven fast-track referral system	BA	UK	Colorectal cancer screening	Eight surgeons, 10 GI physicians	(2 years)
Khan 2008[71]	Direct referral to Hot Clinic	Cohort	UK	Respiratory (COPD)	173 patients 97 (57%) men, 75% current or ex-smokers	6 months
McNally 2003[74]	Fast-track clinic	BA	UK	Oncology (ovarian cancer)	242 patients	6 years
Prades 2011[75]	Seven fast-track hospital indicators	Mixed method	Spain	Oncology (breast, lung, colorectal)	56,020 patients 83 health professionals from 18 clinics 38% GPs	NR
Sved-Williams 2010[72]	**Single entry point for psychiatry**	**BA**	**Australia**	**Psychiatry**	**45 psychiatrists** **301 GPs** **824 patients**	**28 months**

BA, before-and-after; CBA, controlled before-and-after; GI, gastrointestinal; NR, not reported.
Bold text indicates study at higher risk of bias.

appointments. The mean monthly referral rate in the intervention group declined 22% in year 1 and was maintained in year 2. The difference in mean referral rate between the control and intervention was –1.59 intervention; –2.61 control; and –4.39 other comparator. The relative mean rate in reductions in mean referral rates were: 14.5%, –23.7% and –39.5% in period 0, year 1 and year 2, respectively.

Khan *et al.*[71] evaluated the efficacy of direct GP referral to a hospital respiratory specialist team to a 'Hot Clinic' in avoiding hospital admissions. GPs and community nurses directly referred patients threatening an acute hospital admission, by fax, for a rapid assessment. The Hot Clinic service operated Monday to Friday, 09:00–16:00 hours. Patients were seen within 24 hours of the receipt of the referral letter. The consultation included clinical assessment, chest radiograph, laboratory data and a decision whether to treat the patient in the community or to admit the patient to the hospital. The GP would be informed by a typed and faxed letter returned the same day. In total, 27 patients (16%) were admitted directly from the Hot Clinic and 146 (84%) were treated in the community. Of those 146 patients, nine (5%) were later admitted within 1 week and 12 (7%) admitted over 1 week to 1 month after the Hot Clinic appointment. Overall, 125 (72%) were treated successfully in the community without the need for hospitalisation. However, it is unclear if all would have been hospitalised without the clinic.

Sved-Williams and Poulton[72] described and evaluated a service that provided a single point of entry for GPs wishing to refer their patients for one-off psychiatric consultations. All psychiatrists in the region were invited to provide reserved appointments to an administrative officer based at the Department of General Practice. They could specify the number of appointments and withdraw unfilled appointments at any time. To make an appointment, a GP or practice nurse phoned a dedicated number Monday to Friday 09:00–17:00 hours. There was no paperwork, and the GP was supplied with the appointment time, along with the name and contact details of the psychiatrist over the phone. From August 2005 to March 2007, 84% of offered appointments were filled. Use of the service rose from six referrals to 10 per week over the course of the study, and 55% of psychiatrists continued to provide regular appointments after the study period. This study was at higher risk of bias.

Hemingway *et al.*[73] evaluated a protocol-driven rapid-access referral system for colorectal cancer tests. The Leicester Colorectal Test Protocol included a list of presenting symptoms, age criteria for test and the appropriate diagnostic test for each symptom. Patients had investigations either before seeing an outpatient clinician or on the day of the clinic. Referrals were processed by '2-week wait' administration staff using the protocol and assessments booked by these administration staff. There was protection of time slots within the testing suites. Referrals not complying with protocol were redirected to appropriate test without referral back to GP. The data that relate to the intervention period are not clear as they are reported by year rather than before and after. At baseline, the year 1 median time to diagnosis for non-emergencies was 35 days (interquartile range 13–80 days), compared with fast-track (categorised as 2-week wait or 'soon') 21 days (interquartile range 10–48 days). Sixty-two per cent of cancers referred as either 2-week wait or 'soon' were diagnosed within 31 days. After introduction of the intervention (pilot and full implementation) year 3 median time to diagnosis for non-emergencies was 20 days (interquartile range 10–59 days) and for emergencies was 13 days (interquartile range 8–29 days) [year 4 non-emergencies 20 days (interquartile range 10–51 days) and emergencies 13 days (interquartile range 9–23 days)]. During the 2-month full implementation period in year 3, the service received 256 referrals: 64% came through the 2-week wait protocol office and 36% were referred directly to consultants. In these referrals 70% were diagnosed with a pathology and 19 patients were diagnosed with cancer, all within 31 days. Overall during year 3, 79% of patients with colorectal cancer diagnosed who were referred as 2-week wait or 'soon' were diagnosed within 31 days. In year 4, the figure was 82%.

Two studies showed no association with referral outcomes. McNally *et al.*[74] implemented clinic appointments within 2 weeks to a fast-track breast cancer clinic. GPs were informed of the clinic and referral criteria by individual letter, GP newsletter and meetings. The median waiting time for referral to specialist was 3 days (range 0–188 days). This did not change significantly after clinic introduction ($p = 0.05$). The impact of fast-track clinic on referral and diagnosis time variables was not significant.

Prades *et al.*[75] analysed the implementation and effectiveness of a fast-track referral system for cancer which included clinical criteria for primary care referral and patient pathway management in hospital. There was an increase in completeness of hospital data during the intervention period (74% to 96%). Adherence to clinical criteria for including patients in the fast-track system was more than 70% (no specific data reported). About half of all new patients were diagnosed via the fast-track system and the cancer rate declined during the period. The mean time to treatment from primary care was 32 days for breast cancer, 30 for colorectal cancer and 37 for lung cancer. There are no data for patients not referred via the programme to compare these results with.

Direct access to diagnostic testing

Nine interventions provided direct access to diagnostic testing for a range of conditions and, as such, included a range of screening tests [including MRI, dual-energy X-ray absorptiometry (DXA) scanning, computerised tomography (CT) brain scanning, audiology screening, endoscopy, CT (for chronic daily headache) and an open-access urology unit] (*Table 9*).[76–84] Six studies showed a positive effect,[76–81] but three studies were very unclear as to the effect on referral outcomes[82–84] and all studies were considered to be at lower risk of bias. The strength of the evidence was graded as inconsistent.

TABLE 9 Characteristics of direct-access interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
DAMASK 2008[76]	GP direct referral for MRI	RCT	UK	Radiology (MRI)	386 patients	NR
Dhillon 2003[82]	Direct access to DXA scan	RCT	UK	Rheumatology	330 patients 18 practices Patients aged 31 to 89 years	NR
Eley 2010[83]	Direct audiology referrals	Audit	UK	ENT (audiology)	353 patients 178 female, 175 male Mean age 77 (60–96) years	(4 months)
Gough-Palmer 2009[84]	Direct MRI access	Audit	UK	MRI	1798 scans 209 GPs	12 years
Shaw 2006[77]	Open-access serology	cRCT	UK	Serology (dyspepsia)	47 practices	NA
Simpson 2010[78]	Direct access to head CT	Audit	UK	Neurology	4404 referrals 986 GPs	NA
Thomas 2010[80]	Direct access to head CT	Audit	UK	Neurology	232 referrals 72 practices, 309 GPs Patient age range 20–85 years	(1 year)
Thomas 2003[79]	Open-access urology	cRCT	UK	Urology	66 GPs 959 patients	(12 months)
Wong 2000[81]	Open-access endoscopy	CBA	Hong Kong	Endoscopy (dyspepsia)	1334 patients Mean age 74 years	(2 years 10 months)

CBA, controlled before-and-after; cRCT, cluster RCT; NR, not reported.

DAMASK[76] looked at a process to allow direct referral from general practice to a local radiology department for MRI to allow early access to imaging. Early MRI was associated with higher NHS cost by £294 per patient and a larger number of quality-adjusted life-years (QALYs) by 0.05. There was an incremental cost per QALY gained of £5840 below the cost threshold of £20,000 per QALY commonly used in the NHS. This was, therefore, considered to be a cost-effective use of NHS resources.

Shaw *et al.*[77] evaluated the effect of providing a *Helicobacter pylori* serology service for GPs who requested open-access endoscopy. General practices were stratified by endoscopy referral rate and randomised into two groups. The intervention group was provided with access to *H. pylori* serology testing and encouraged to use it in place of endoscopy for patients aged < 55 years with dyspepsia. They were sent written information promoting the use of the serology service in place of endoscopy for patients aged < 55 years suffering from dyspepsia without alarm symptoms and were issued with a summary of the Maastricht

consensus statement on the management of *H. pylori*. The GPs remained free to refer for open-access endoscopy as they felt necessary. The number of endoscopy referrals fell in both groups during the study period, but fell by a greater amount in the intervention group than in the control group. During the 2-year study period, 626 referrals were received from the intervention group, compared with 771 from the control group. This accounted for a significant reduction in referrals for endoscopy in the intervention group compared with the control group: 18.8% difference (95% CI 5.0% to 30.6%, $p = 0.009$).

Simpson *et al.*[78] assessed GP direct access to CT for patients with chronic daily headache; 10.5% of scans indicated abnormalities. GPs reported that if direct-access CT had not been available then 44% would have referred to neurology and 38% to general medicine. Ten per cent of patients would not have been referred. Following scans, 86% did not require further specialist referral. Sixty-seven per cent of reports issued following scans were received in 1 week and 79% were received within 14 days. Without direct access, 90% of patients would have been referred at a cost estimate of £503,428. The cost of scans and outpatient appointments for patients in the study was estimated to be £602,026. A specialist headache clinic where, typically, 29% are referred for scans would cost £131,991, with a further review appointment costing total £688,708. Therefore, the cost saving of this intervention was estimated at £86,681.

Thomas *et al.*[79] evaluated the effectiveness and efficiency of a guideline-based open-access urological investigation service. General practices were randomised to receive either referral guidelines and access to the investigation service for LUTS or referral guidelines and access to the investigation service for microscopic haematuria. Participating GPs were offered a 2-hour educational meeting and were mailed a guideline package which included a guideline booklet, a quick reference flow chart and structured referral checklists. GPs' compliance with referral guidelines increased (difference in means 0.5, 95% CI 0.2 to 0.8; $p = 0.001$). Approximately 50% of eligible patients were referred through the new system. The number and case mix of referrals were similar. The intervention reduced the waiting time from referral to initial outpatient appointment (ratio of means 0.7; 95% CI 0.5 to 0.9, patients with LUTS only) and increased the number of patients who had a management decision reached at initial appointment (OR 5.8, 95% CI 2.9 to 11.5; $p < 0.001$, both conditions). Patients were more likely to be discharged within 12 months (OR 1.7, 95% CI 0.9 to 3.3; $p = 0.11$). There were no significant changes detected in patient outcomes.

Thomas *et al.*[80] evaluated the referral rate of patients with chronic headache to open-access CT and the effect on neurology referral rates at three sites. Scanned patients had a lower referral rate to neurology immediately and in the year following the scan. The referral rate to open-access service was 1.2% of headache consultations by GPs. Open-access scans accounted for 4% of the annual number of scans. Of 215 scans, three lesions were identified which may have caused chronic headache (1.4% yield for significant findings and 10.2% for non-significant findings), and 88.4% of scans were normal. The service was used by 45% of GPs from 82% of practices. At 1-year follow-up, 14% (30) were subsequently referred to neurology clinic because of headaches; of these, 40% were referred at the same time as the CT scan request and 60% were referred after their brain-scan CT. Of these later referrals, 17 of the 30 had normal CT findings.

Wong *et al.*[81] evaluated a system of open-access endoscopy for dyspepsia. Family physicians were able to arrange upper endoscopy directly with the endoscopy unit in addition to conventional referrals. Extra sessions each week were allocated to open-access requests to ensure waiting time not affected. Waiting time for the intervention group was a mean of 6 weeks. For the control group the mean waiting time was 17.5 weeks to consultation and then another 4.5 weeks to procedure (a total of 22 weeks). During this waiting time only antacids were prescribed. There were abnormal findings in 19% of patients from the intervention group and 22% from consultant referral (difference not significant). Only two patients (0.2%) referred via open access were considered inappropriate. There were no significant differences in intervention versus control in peptic ulcer and cancer detection rate, but significantly more non-ulcer non-cancer abnormal findings in referrals via consultant (0.5% vs. 5%, $p < 0.005$). Of the intervention patients, 76% required no further consultation for at least 4 weeks after endoscopy, 12% attended a GP, and 12% were referred to specialist or were admitted to hospital.

Three further studies of direct-access screening interventions showed no clear effect on referral outcomes. Dhillon *et al.*[82] evaluated the impact of GP direct access to DXA scanning for patients at risk of osteoporosis; no specific guidelines were issued. They reported mostly clinical outcomes, but included some limited referral rate data. Before intervention, the range of number of referrals for scanning was 0.01% to 0.6% (median 0.2%). The number of referrals to a specialist clinic was 24 in the intervention group, compared with 12 in the control group. The study also concludes that direct access is more economically efficient, but it is not fully explained in the data how this is evaluated. Eley *et al.*[83] assessed the effectiveness of direct referral to audiology clinics on ENT appointments and appropriate GP use of the clinics. Direct-referral audiology clinics (DRACs) for the assessment and provision of hearing aids in those > 60 years were introduced as a means of decreasing outpatient waiting times and demand on ENT appointments. Of the 353 patients seen within the DRAC clinics, 320 were ultimately provided with a hearing aid. Fifty-five patients require review by an otolaryngologist, either by direct referral or via their GP. The greatest lack of adherence to the referral criteria for DRAC appointments related to appropriate treatment of wax within the community. Gough-Palmer *et al.*[84] looked retrospectively at GP access to MRI scans. There was no protocol, guidance or formal consultant or radiologist vetting in place. GP-requested scans, as a percentage of the workload of the department, were low (around 2.6%). While workload of the department increased over the study period, this percentage remained stable. Forty-eight per cent of scans requested were normal or minor degenerative changes; 26% demonstrated serious pathology warranting hospital referral.

Enhanced referral information

These interventions were dominated by studies conducted in dermatology where images were sent electronically or by post to the specialist to assist in determining whether or not a referral was necessary (*Table 10*).

Leggett *et al.*[85] compared outcomes of referral for dermatology appointments between patients whose referral letters did and did not include instant photograph(s) taken by the GP. The GP took photograph(s) of the skin condition and sent them with a referral letter to the dermatologist in a numbered, sealed envelope. If a diagnosis was not possible, patients were given an appointment. If diagnosis was possible,

TABLE 10 Enhanced referral information interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Knol 2006[90]	**Electronic consultation with images**	**BA**	**Netherlands**	**Dermatology**	**505 consultations** **29 GPs**	**(2 years)**
Leggett 2004[85]	Referral letter with images	RCT	UK	Dermatology	136 referrals 20 GPs	NR
McKoy 2004[89]	Electronic consultation with images	BA	USA	Dermatology	52 patients Aged 25–89 years 46% female	NR
Tadros 2009[96]	**Electronic referral with images**	**RCT**	**UK**	**Oncology (skin cancer)**	**300 referrals**	**NR**
Whited 2002[87]	Electronic consultation with images	RCT	USA	Dermatology	NR	NR

BA, before-and-after; NR, not reported.
Bold text indicates studies at higher risk of bias.

a letter was sent to the GP with advice on management; some patients were also given an appointment for further management. Control group patients were given outpatient appointments in the usual way. For 63% of the study group (45/71), a diagnosis and a management plan were made without the patient requiring an appointment. This included 38% (27/71) of patients who, after diagnosis and initial management, needed an appointment, and 25% (18/71) who did not. The remainder of the study group (37%: 26/71) required a face-to-face consultation. This reduced the numbers requiring an outpatient appointment by 25% compared with the control group. The mean time for formulation of a management plan for patients without an appointment was 17 days (SD 11 days); waiting times for appointments in study and control groups were similar (mean 55 days; SD 40 days).

Whited *et al.*[87] compared usual care (text-based electronic consultation) with teledermatology (usual care plus digital images and standardised history). The standardised history included demographic information, patient-reported medical history, dermatology history, lesion location, size and duration of presence. The consultant answered by scheduling an appointment or by relaying a diagnosis and management plan back to the GP. Patients in the intervention arm reached time to initial defined intervention sooner than those in the usual-care arm (median 41 vs. 127 days, $p < 0.001$) and 18.5% of patients in the intervention arm avoided the need for a dermatology clinic visit, compared with no patients in the usual-care arm ($p < 0.001$). A further satisfaction survey as part of the RCT was also reported.[88]

McKoy *et al.*[89] evaluated the accuracy, access time, cost and acceptance by patients and physicians of an asynchronous teledermatology referral intervention in primary care. GPs in a multispecialty group referred patients for teledermatology consultation. Same-day history and digital images taken by a nurse were electronically sent to a dermatologist who returned a diagnosis to the referring physician. History was adequate for diagnosis in 81% of cases and images were adequate in 75% of cases. Accuracy of the teledermatology diagnosis in cases with adequate images was 97%; accuracy for all cases was 92%. A dermatology visit was recommended in 26% of cases with adequate images and in 42% of all cases. Access time for a teledermatology opinion was 1.9 days, compared with 52 days for a regular dermatology appointment.

Knol *et al.*[90] aimed to reduce dermatology referrals using teledermatology. One overview and two detailed digital photographs of the skin problems were taken on a digital camera and attached to an e-mail message containing standard clinical information. The e-mail was sent to a dermatologist who replied after evaluation. Using teledermatology, 163 patients were not referred, a reduction of 163 out of 306 or 53%. There was no significant difference between dermatologists for secondary referral ($\chi^2 = 1.6$, $p = 0.45$), and patient sex did not affect secondary referral ($\chi^2 = 0.8$, $p = 0.36$). This study was at higher risk of bias.

Hockey *et al.*[91] examined the feasibility of a low-cost store-and-forward teledermatology service for GPs in regional Queensland. GPs were required to decide whether to refer for electronic consultation with the hospital or whether to refer to outpatients as usual. Electronic communication with the hospital was through a secure web-based system. Over 6 months, 63 referrals were processed by the teledermatology service. In the majority of cases, the referring doctors were able to treat the condition after receipt of e-mail advice from the dermatologist. In 10 cases (16%) additional images or biopsy results were requested because image quality was inadequate. The average time between a referral being received and clinical advice being provided was 46 hours. This study was at higher risk of bias.

Specialist consultation prior to referral

Specialist consultation prior to referral was the basis of six interventions (*Table 11*).[86,89,92–95] The interventions varied from a shared care programme with an oncologist, a system to contact a spine orthopaedist for red flag symptoms, to a virtual outreach intervention to share medical records between GP and specialist. All interventions showed a positive effect on at least one referral-related outcome, although results were sometimes mixed. The evidence for these interventions was rated as stronger.

TABLE 11 Characteristics of interventions which included specialist consultation prior to referral

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Eminovic 2009[86]	Teledermatology to confer with specialist	cRCT	the Netherlands	Dermatology	85 GPs from 35 practices Five dermatologists	(1 month)
Harrington 2001[93]	Flow chart/ algorithm for care	Case series	USA	Orthopaedics (low-back pain)	581 patients	3 years
Jaatinen 2002[95]	Consideration of teleconsultation	RCT	Finland	Specialists	78 patients	5 months
McKoy 2004[89]	Electronic consultation with images	BA	USA	Dermatology	52 patients Aged 25–89 years 46% female	NR
Nielsen 2003[92]	Knowledge transfer GP/oncologist	RCT	Denmark	Oncology	248 referrals	(3 and 6 months)
Wallace 2004[94]	Virtual outreach between GP and specialist	RCT	UK	Specialists	134 GPs from 29 practices and 20 consultant specialists	(6 months)

BA, before-and-after; cRCT, cluster RCT; NR, not reported.

Eminovic *et al.*[86] determined whether or not teledermatological consultations can reduce referrals to a dermatologist by GPs. The GPs randomised to the intervention used a teledermatological consultation system to confer with a dermatologist, whereas those in the control group referred their patients according to usual practice. A training programme for the intervention GPs included instructions on taking digital images, downloading images to the computer, managing files and using the website. Dermatologists were taught how to use the website and complete the study forms. All patients, regardless of their condition, were seen in the office by a dermatologist after approximately 1 month. The five dermatologists considered a consultation preventable for 39.0% of patients who received teledermatological consultation and 18.3% of 169 control patients, a difference of 20.7% (95% CI 8.5% to 32.9%). At the 1-month dermatologist visit, 20.0% of patients who received teledermatological consultation had recovered, compared with 4.1% of control patients. No significant differences in patient satisfaction were found between groups.

Nielsen *et al.*[92] conducted an intervention to determine the effect of a shared care programme on the attitudes of newly referred cancer patients towards the health-care system and their health-related quality of life and performance status, and to assess patients' reports on contacts with their GP. The shared care programme included transfer of knowledge from the oncologist to the GP, improved communication between the parties and active patient involvement. The shared care programme had a positive effect on patient evaluation of co-operation between the primary and secondary health-care sectors. The effect was particularly significant in men and in younger patients (18–49 years) who felt that they received more care from the GP and were left less in limbo. Younger patients in the intervention group rated the GP's knowledge of disease and treatment significantly higher than younger patients in the control group. The number of contacts with the GP was significantly higher in the intervention group. The quality of life questionnaire and performance status showed no significant differences between the two groups.

Harrington *et al.*[93] developed an algorithm for referral to a spine orthopaedists which included a flow chart for care and a system for separating urgent cases from others. GPs were encouraged to contact the surgeon or physician manager for advice on patients with red flag symptoms. This resulted in a receptionist

taking information which was verified by a nurse co-ordinator. The physician manager then reviewed the information to determine a care plan, which was instigated by the nurse co-ordinator. Following introduction of the guidelines little change was documented from traditional referral patterns (no other information provided on this). Three years later, in response to long waiting lists, the referral management programme was put in place, resulting in a shift of care from spine orthopaedists to primary physicians. Before implementation, 28% of patient visits for low-back pain were referred to a specialist and 72% were treated in primary care. During the transition year, 13% of patient visits were referred to a specialist and 87% were treated in primary care. In the year after implementation, 17% were referred to a specialist care and 83% treated in primary care.

Wallace *et al.*[94] considered whether or not virtual outreach would reduce offers of hospital follow-up appointments and reduce numbers of medical interventions and investigations, reduce numbers of contacts with the health-care system, have a positive impact on patient satisfaction and enablement, and lead to improvements in patient health status. Joint teleconsultation between GPs, specialists and patients prior to referral was compared with standard outpatient referral. Fifty-two per cent of patients in the virtual outreach group were offered a follow-up appointment, compared with 41% in the standard outpatient group. The overall proportion of patients receiving an offer of follow-up was 46% in the virtual outreach group and 42% in the standard outpatient group (OR 1.19, 95% CI 0.99 to 1.44), but significant heterogeneity remained for both site and specialty ($p = 0.001$ and $p < 0.001$, respectively). Fewer tests and investigations were ordered in the virtual outreach group, by an average of 0.79 per patient. In the 6-month period following the index consultation, there were no significant differences overall in number of contacts with general practice, outpatient visits, accident and emergency contacts, inpatient stays, day surgery and inpatient procedures or prescriptions between the randomised groups.

Jaatinen *et al.*[95] considered teleconsultation as a replacement for referral to an outpatient clinic. GPs had to decide whether to refer for electronic consultation with the hospital or whether to refer to outpatients as usual. Electronic communication with the hospital was through a secure web-based system. All patients treated by teleconsultation said that they wanted the same procedure in the future and 63% of the control group said that they would prefer a teleconsultation next time ($p = 0.02$), although they were nearly as satisfied as those who had received a teleconference ($p = 0.37$). The doctors quickly learned to exploit the telecommunication model. The responsibility for treatment was maintained, with the primary-care centre in 52% of cases using teleconsultation without any hospital visit required. The GPs and doctors agreed on follow-up treatment.

Tadros *et al.*[96] compared referral of suspect skin cancers as well as non-malignant symptomatic skin lesions using high-quality digital images transferred via a secure electronic referral system versus conventional pathways. A comparison of the diagnoses made from digital images with the diagnoses confirmed on pathology reports for lesions excised is described using a random selection of patients' images and referrals. The study concludes that digital image referral for skin malignancy and other cutaneous lesions reduced the interval between referral and diagnosis by 81% and referral to commencement of treatment in suspect lesions by 30%. Diagnostic accuracy in a random sample of 30 patients was comparable with that reported for patients seen in face-to-face consultations. High levels of GP and patient satisfaction were recorded. This study was at higher risk of bias.

Electronic referral systems

Electronic referral systems were reported in 10 studies (*Table 12*).[97–106] Although each system differed, and included referral to different specialties, they all consisted of referral via an online system as opposed to via letter or e-mail. In one case a clinical reviewer assessed the referral for appropriateness,[100] and in a second study a referral pro forma was included to try to guide appropriate referral, but in all other studies all referrals were accepted. Two studies[103,104] also included aspects of specialist consultation but this was not the main focus of the intervention. Nine of the interventions reported a positive effect[97–105] and all studies were considered to be at lower risk of bias. The evidence was rated as stronger.

TABLE 12 Characteristics of electronic referral interventions

Study (first author and year)	Intervention	Design	Country	Specialty/ treatment	Sample size and details where provided	Study duration (follow-up)
Chen 2010[100]	E-referral consultation requests compared with paper	BA	USA	Specialists	One hospital: 500,000 outpatients annually GPs in five hospitals: 11 community GPs and 10 independent GPs	6 months
Dennison 2006[99]	Electronic surgical referral	Cross-sectional	UK	Colorectal and gastroenterology clinics	243 referrals 22 GPs in four practices 54 patients electronically referred, 189 referred on paper	NR
Gandhi 2008[108]	Electronic referral tool	RCT	NR	Specialists	430 referrals	2 years
Jiwa 2012[105]	Referral Writer software	BA	Australia	Six specialties	NR	(4 months)
Kennedy 2012[106]	Electronic referral system	Audit	UK	Oncology (head and neck cancer)	190 patients 55% female, aged 19–92 years, mean age 58 years	NR
Kim 2009[98]	Impact of electronic referrals	Cross-sectional	USA	Clinical care	298 GPs	NR
Kim-Hwang 2010[102]	E-referral compared with paper	BA	USA	Specialists	505 specialists	2 years
Nicholson 2006[97]	Design and delivery of electronic referral system	Audit	Australia	Oncology	NR	1.5 months
Patterson 2004[104]	Structured form for neurology referrals	Cohort	UK	Neurology	76 referrals 27 male, 48 female Mean age 44 years, range 16–80 years	14 months (6 months)
Stoves 2010[103]	Electronic sharing of health records	BA	UK	Nephrology	17 practices	NR

BA, before-and-after; NR, not reported.

Nicholson *et al.*[97] completed an evaluation of an online referral and booking system for oncology referrals which included the design, development and deployment of the software in a new approach to information management (similar to choose-and-book system) for suspected cancer referrals. GP satisfaction with the new system was high. Hospital specialists were supportive; however, they noticed little difference in the processes from their perspective. All participants agreed that the system had meant that referrals were being efficiently actioned and that it made the process easy for patients. Patients perceived no major disadvantage.

Kim *et al.*[98] evaluated GPs to assess the impact of electronic referrals on workflow and clinical care. They distributed an 18-item, web-based questionnaire to 368 GPs who had the option of referring to San Francisco General Hospital. They asked participants to rate the time spent submitting a referral, guidance of work-up, wait times and change in overall clinical care compared with prior referral methods using five-point Likert scales. Over half (55.4%) worked at hospital-based clinics, 27.9% worked at county-funded community clinics and 17.1% worked at non-county-funded community clinics. Most (71.9%) reported that electronic referrals had improved overall clinical care. Providers from non-county-funded clinics (OR 0.40, 95% CI 0.14 to 0.79) and those who spent more than 6 minutes submitting an electronic referral (OR 0.33, 95% CI 0.18 to 0.61) were significantly less likely than other participants to report that electronic referrals had improved clinical care.

Dennison *et al.*[99] implemented an electronic surgical referral pro forma system, including patient details, symptoms, urgent/routine, provisional diagnosis and a free-text box, for referral to colorectal and gastroenterology clinics. Patients were 21% less likely to change their appointment when referred electronically. Time from referral to appointment was 8 weeks for the electronic system and 10 weeks for the paper system. Time from referral to booking was 0 days for the electronic system, compared with 7 days for the paper system (significantly different; data not given). There was an 8.5% rate of non-attendance in the electronic system, compared with 22.5% in the paper system (significantly different; data not given).

Chen *et al.*[100] evaluated a new consultation request process, called e-Referral, which was integrated into a hospital's electronic health record. Clinician reviewers screen requests to evaluate urgency, choice of specialties, whether or not sufficient workup information is provided, and whether a specialist needs to see the patient or can guide the primary care clinician through the e-Referral system. Waiting times for non-urgent visits declined in seven of eight medical specialty clinics by up to 90% during the first 6 months of use. The percentage of referrals deemed inappropriate by medical and surgical specialists was cut by more than half (no data given). For clinics that had been plagued by long waiting times, implementation of e-Referral resulted in dramatic improvements. For example, in rheumatology, the median waiting time for a non-urgent appointment initially dropped from 126 days to 29 days. The majority of primary care clinicians reported that e-Referral improved patient care, but those with poorer access to the electronic health record found it more time-consuming than the previous paper-based system.

Gandhi *et al.*[108] reported on implementation of an electronic referral tool to analyse its impact on communication between primary care and specialists. They studied one practice site that implemented the referral tool and one that did not, and surveyed affiliated specialists, GPs and patients about referral communication. Specialists more often received information before the referral visit from intervention GPs versus non-intervention GPs (62% vs. 12%, $p < 0.001$), a finding that persisted after adjustment (RR = 3.3, $p = 0.008$). Intervention GPs more often received communication from specialists (69% vs. 50%, $p = 0.08$). Patients of intervention GPs were more likely than patients of control GPs to report that specialists had received information before their visit (70% vs. 43%, $p = 0.007$).

Kim-Hwang *et al.*[102] aimed to determine the impact of 'e-Referral', compared with paper-based referral, on specialty referral rates. The study was based on a visit-based questionnaire appended to new patient charts at randomly selected specialist clinic sessions before and after the implementation of e-Referrals (using a web-based system). A specialist reviewer (physician or nurse) reviewed the referrals and determined whether or not it was appropriate to schedule an appointment. It was difficult to identify the reason

for referral in 19.8% of medical and 38.0% of surgical visits using paper-based methods versus 11.0% and 9.5% of those using e-Referral ($p = 0.03$ and $p < 0.001$). Of those using e-Referral, 6.4% and 9.8% of medical/surgical referrals using paper methods versus 2.6% and 2.1% were deemed not completely appropriate ($p = 0.21$ and $p = 0.03$). Follow-up was requested for 82.4% and 76.2% of medical and surgical patients with paper referrals versus 90.1% and 58.1% of e-Referrals ($p = 0.06$ and $p = 0.01$). Follow-up was considered avoidable for 32.4% and 44.7% of medical/surgical follow-ups with paper-based methods vs. 27.5% and 13.5% with e-Referral ($p = 0.41$ and $p < 0.001$).

Stoves *et al.*[103] evaluated an intervention where the electronic sharing of primary care electronic health records with the nephrology service was introduced to intervention practices. Participating GPs attended education workshops and received paper and e-guidance about the new service. The service allowed GPs to send electronic referrals and share patient electronic health records with a renal specialist after first obtaining verbal patient consent. GPs use criteria agreed in local guidelines to 'request advice' or 'question the need' for hospital clinic review. There was a significant reduction in paper referrals from intervention practices. The mean [standard error (SE)] interval between the GP sending an e-consultation referral and the renal specialist submitting an electronic response was 7 (0.8) days. This contrasted with a mean wait of 55.1 (1.6) days between the GP sending a paper referral and the patient attending a hospital clinic. When GPs were requesting clinic review by letter, only 56% of referrals were appropriate according to local criteria (71% and 52% for intervention and non-intervention practices, respectively), but 98% of these were accepted for hospital clinic review. By contrast, 90% of e-consultations that questioned the need for clinic review were appropriate, and clinic assessment was recommended in only 27% of cases.

Patterson *et al.*[104] conducted an intervention to determine if an e-mail triage system between GPs and a neurologist for new outpatient referrals was feasible, acceptable, efficient, safe and effective. A structured form was devised for GPs to refer patients. This set out the required history and examination and was either sent as an e-mail attachment or incorporated into the body text of the e-mail. When the neurologists received the e-mail referral they decided whether or not advice alone was appropriate, whether or not investigations were needed, or whether or not a clinic visit was necessary. When the investigation results were available, either a clinic appointment was made or further advice was given. Forty-three per cent of participants required a clinic appointment, 45% were managed by e-mail advice alone and 12% were managed by e-mail plus investigations. Forty-four per cent of the neurologist's time was saved, compared with conventional consultation; total time spent was, therefore, 1270 minutes (mean of 16.7 minutes per patient). No deaths or significant changes in diagnosis were recorded during the 6-month follow-up period.

Jiwa *et al.*[105] explored if increasing the amount of relevant information in referral letters between GPs and hospital specialists helps in the scheduling of appointments for patients. They used Referral Writer software, a software system to assist referral writing, consisting of a pro forma that selects relevant information from the electronic patient record and requests the doctor to choose one of six specialties for referral: urology, breast, gynaecology, upper gastrointestinal (GI), colorectal and respiratory. The doctors were finally prompted to enter details about the patient's condition. Each GP referred 5.6 patients on average (range 1–14) before the intervention and 4.8 patients (0–14) after it. The amount of relevant information in the referrals improved substantially (mean difference 37%, 95% CI 30% to 43%; $p < 0.001$). For 91% of referrals after the intervention both specialists in each specialty were confident or very confident that they had enough information to decide when the patient should come to their clinic; this was an increase from 50% before the intervention ($p = 0.001$). There was no association between the amount of relevant information and the final diagnosis.

One further study of an electronic referral system showed no effect on referral. Kennedy *et al.*[106] evaluated a fast-track electronic referral system (including referral guidelines) for suspected head and neck cancer. Fifty-two per cent of urgent referrals required no further investigation following assessment and were discharged. Head and neck cancer detection rate (percentage of patients with confirmed diagnosis from total number of referrals) was 8%. Overall cancer detection rate was 15%. During the time period of system operation (1 year), only 14% of the total number of head and neck cancers diagnosed were

referred via the electronic system. All others had been referred by non-urgent referral channels (by the same group of practitioners). Twenty-seven different GP practices used the system to refer; however, one city-centre practice accounted for 17% of referrals. Therefore, in this case, 86% of patients diagnosed with cancer bypassed the system.

Decision support tools

The 10 decision support tools all aimed to assist GPs in making referrals and included real-time computer or internet-based systems, as well as a librarian consultation service, the effect of patient-specific ratings versus conventional guidelines, and automatic reporting of estimated glomerular filtration rate (eGFR) to inform referral decision (*Table 13*). Six studies showed a positive effect,[107,109–113] but four reported a negative effect or no effect.[114–117] All studies were considered to be at lower risk of bias. The strength of the evidence was graded as inconsistent.

McGowan *et al.*[107] evaluated whether or not information provided by librarians to answer clinical questions positively impacted time, decision-making, cost savings and satisfaction. The 'just-in-time information' librarian consultation service was designed to provide a rapid response to clinical questions during patient visit hours. The questions were submitted by the participants and each question was randomly assigned to the intervention (librarian information) or control (no librarian information) group. If the question was randomised to the control group, participants received a message within 1 minute that their question

TABLE 13 Characteristics of decision support interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Akbari 2012[110]	Automatic reporting eGFR	BA	Canada	Nephrology	2672 patients 12.5% aged 65+ years	2 years (1 year)
Emery 2007[111]	Computer decision support system	cRCT	Australia	Regional cancer genetics service	45 GPs practice teams	(12 months)
Greiver 2005[114]	PDA software to diagnose angina	cRCT	UK	Cardiology (angina)	18 GPs 65 patients; patients aged 30–75 years	(7 months)
Junghams 2007[109]	Patient-specific ratings	RCT	UK	Cardiology (angina)	145 GPs	NR
Knab 2001[112]	Computer-based decision support	BA	USA	Chronic pain referral	100 patients	1 year
Magill 2009[115]	Computer-based referral enhancing	BA	USA	Colonoscopy	NR; patients aged 50+ years	NR
Mariotti 2008[113]	Prioritisation by GP and specialist	Audit	Italy	Gastroscopy colonoscopy	438 outpatients	7 months
McGowan 2008[107]	Librarian consultation	RCT	Canada	Specialists	82 GPs; five nurses; one specialist	(24 hours)
Slade 2008[117]	Referral threshold assessment	cRCT	UK	Mental health	281 GPs 1061 referrals	NR
Tierney 2003[116]	Computer-based care suggestions	RCT	UK	Cardiology	706 patients	1 year

BA, before-and-after; cRCT, cluster RCT; PDA, personal digital assistant.

would not be answered. Each participant had clinical questions randomly allocated to both intervention (librarian information) and control (no librarian information) groups. Participants were trained to send clinical questions via a hand-held device. The average time for 'just-in-time information' librarians to respond to all questions was 13.68 minutes per question (95% CI 13.38 to 13.98 minutes). The average time for participants to respond their control questions was 20.29 minutes per question (95% CI 18.72 to 21.86 minutes). Using an impact assessment scale rating cognitive impact, participants rated 62.9% of information provided to intervention group questions as having a highly positive cognitive impact. They rated 14.8% of their own answers to control question as having a highly positive cognitive impact, 44.9% as having a negative cognitive impact and 24.8% as having no cognitive impact at all.

Junghams *et al.*[109] assessed the effect of patient-specific ratings versus conventional guidelines on appropriate investigation of angina. Intervention physicians received patient-specific ratings (online prompt stating whether the specific vignette was considered appropriate or inappropriate for investigation, with access to detailed information on how the ratings were derived) and control physicians received conventional guidelines from the American Heart Association and the European Society of Cardiology. Physicians made recommendations on 12 web-based patient vignettes before and on 12 vignettes after these interventions. Decisions for exercise electrocardiography were more appropriate with patient-specific ratings [819/1491 (55%)], compared with conventional guidelines [648/1488 (44%)] (OR 1.57, 95% CI 1.36 to 1.82). The effect was stronger for angiography [1274/1595 (80%) with patient-specific ratings compared with 1009/1576 (64%) with conventional guidelines (OR 2.24, 95% CI 1.90 to 2.62)]. Within-arm comparisons confirmed that conventional guidelines had no effect but that patient-specific ratings significantly changed physicians' decisions towards appropriate recommendations for exercise electrocardiography (55% vs. 42%; OR 2.62, 95% CI 2.14 to 3.22) and for angiography (80% vs. 65%; OR 2.10, 95% CI 1.79 to 2.47).

Akbari *et al.*[110] assessed whether or not automatic reporting of the eGFR, along with an ad hoc educational component for primary care physicians, would increase the number of appropriate referrals to nephrology. Concurrent with the introduction of automatic reporting of the eGFR, the nephrology service mailed an algorithm to all primary care physicians in the Champlain Local Health Integration Network. This algorithm explained the interpretation of the eGFR and appropriate parameters for referrals to nephrology, based on the value. In addition, ad hoc educational sessions (lectures and workshops) were provided to the primary care physicians to discuss interpretation of the eGFR results and parameters for referral to nephrology. In the year after automatic reporting began, the number of referrals from primary care physicians increased by 80.6% (95% CI 74.8% to 86.9%). The number of appropriate referrals increased by 43.2% (95% CI 38.0% to 48.2%). However, there was no significant change in the proportion of appropriate referrals between the two periods (–2.8%, 95% CI –26.4% to 43.4%). In the year after automatic reporting of the eGFR was introduced, the total number of referrals increased significantly among patients ≥ 80 years (percentage-point change 8.0, $p < 0.001$) and among women (percentage-point change 12.6, $p < 0.001$).

Emery *et al.*[111] evaluated the effect of an assessment strategy using the computer decision support system [the Genetic Risk Assessment on the Internet with Decision Support (GRAIDS) software] on the management of familial cancer risk in British general practice in comparison with best current practice. Training in the new assessment strategy and access to the GRAIDS software (GRAIDS arm) was conducted and compared with an educational session and guidelines about managing familial breast and colorectal cancer risk. All GPs and practice nurses attended a 45-minute educational session on cancer genetics, delivered at their general practice. They were also introduced to the principles of the GRAIDS intervention. There were more referrals to the Regional Genetics Clinic from GRAIDS than to control practices (mean 6.2 and 3.2 referrals per 10,000 registered patients per year; mean difference 3.0 referrals; 95% CI 1.2 to 4.8; $p = 0.001$). Referrals from GRAIDS practices were more likely to be consistent with referral guidelines (OR 5.2, 95% CI 1.7 to 15.8; $p = 0.006$). Patients referred from GRAIDS practices had lower cancer worry scores at the point of referral (mean difference 1.44, 95% CI 0.23 to 2.64; $p = 0.02$).

Knab *et al.*[112] determined whether or not computer-based decision support (CBDS) could enhance the ability of GPs to manage chronic pain. Structured summaries were generated for 50 chronic pain patients referred by GPs to a pain clinic. A pain specialist used a decision support system to determine appropriate pain therapy and sent letters to the referring physicians outlining these recommendations. Separately, five GPs used a CBDS system to 'treat' the 50 cases. One year later, the hospital database provided information on how the actual patients' pain was managed and the number of patients rereferred by their GP to the pain clinic. On the basis of CBDS recommendations, the GP subjects 'prescribed' additional pain therapy in 213 of 250 evaluations (85%), with a medical appropriateness score of 5.5 ± 0.1. Only 25% of these chronic pain patients were subsequently rereferred to the pain clinic within 1 year. The use of a CBDS system may improve the ability of GPs to manage chronic pain and may also facilitate screening of consults to optimise specialist utilisation.

Mariotti *et al.*[113] evaluated a new method of prioritisation of patients suffering from significant GI disorders needing rapid access to diagnostic procedures. GPs used a ranking of waiting times for different levels of clinical priority called homogenous waiting groups. Specialists assigned a priority level for each patient as well as evaluating the appropriateness of the referral and the presence of significant endoscopic disorders. Agreement between GP and specialist was evaluated. Most referrals (74.4%) were deemed low priority by GPs, with no maximum waiting time assigned. The level of agreement between GPs and specialists with regard to patient priorities was poor to moderate; for gastroscopy the kappa was 0.31 and for colonoscopy it was 0.44. There was an association between the proportion of significant disorders identified with endoscopy and the priority assigned to the referral ($\chi^2 = 18.9$; 1 df; $p < 0.001$). The overall proportion of referrals deemed inappropriate by specialists was 22.1%.

Four further decision support studies showed no positive association with referral outcomes. Greiver *et al.*[114] determined the effectiveness of a personal digital assistant (PDA) software application to help family physicians to diagnose angina among patients with chest pain. Intervention GPs received a Palm PDA (which included the angina diagnosis software). They prospectively recorded the process of care for patients presenting with suspected angina over seven months. Fourteen of the 28 patients in the control arm (50%) and 30 of the 37 patients in the PDA arm (81%) were referred for cardiac stress tests ($p = 0.007$), an absolute difference of 31% (95% CI 8% to 58%). There was a trend towards more appropriate use of stress testing (48.6% with the PDA vs. 28.6% control), an increase of 20% (95% CI –11.54% to 51.4%; $p = 0.284$). There was also a trend towards more appropriate use of nuclear cardiology following cardiac stress testing (63.0% vs. 45.5%), an absolute increase of 17.5% (95% CI –13.9% to 48.9%; $p = 0.400$). Referrals to cardiologists did not increase (38.2% with the PDA vs. 40.9%, $p = 0.869$). A referral was more likely to have been made if the final diagnosis was angina (likelihood ratio for referral 15.455, 95% CI 2.124 to 112.431), so GPs appeared to refer appropriately.

Magill *et al.*[115] evaluated a computer-based system to enhance referral for colonoscopy. The intervention had three components: (1) a pop-up prompt for screening colonoscopy on electronic medical records (EMRs) was modified; (2) education sessions for primary care providers comprising epidemiology of colon cancer, strategies for early detection, how to use EMRs and optimal clinic workflow to facilitate screening were provided; and (3) medical assistants were asked to discuss screening with eligible patients before they were seen by a physician and to initiate preliminary orders for tests. There were also best practice alerts, computerised documentation of referral status and individual physician feedback, which were implemented later. Individual site providers experienced very different local conditions and changes during the course of the project, for example relocation, new services, personnel change, and introduction of revenue for screening site and physician from referrals. At baseline, monthly referral rates were 5–7%. The pop-up prompt and provider education introduced over a 2-month period showed little or no immediate correlation with referral. Initiation of medical assistant workflow change 2 months later was associated with an 11% increase in referral rate. Small increases were observed after best practice alerts and computerised documentation of referral status was implemented 2.5 years after the initial intervention (no details given of these intervention methods). At 4 years, referral rates remained above baseline.

Tierney *et al.*[116] assessed the effects of computer-based cardiac care suggestions. Evidence-based cardiac care suggestions, approved by a panel of local cardiologists and general internists, were displayed to GPs and pharmacists as they cared for enrolled patients. Evidence-based guidelines published by the Agency for Health Care Policy and Research and national professional organisations were used to develop the cardiac care rules. The cardiac care suggestions were printed at the end of the medication list on the encounter form and displayed as 'suggested orders' on GPs' workstations. GPs could view the guidelines and references via the 'help' key. Subjects were followed for 1 year, during which they made 3419 primary care visits and were eligible for 2609 separate cardiac care suggestions. The intervention had no effect on physicians' adherence to the care suggestions (23% for intervention patients vs. 22% for controls). There were no intervention–control differences in quality of life, medication compliance, health-care utilisation, costs or satisfaction with care.

Slade *et al.*[117] investigated whether or not introducing a standardised assessment of severity improved referral agreement. Prior to a mental health referral, GPs completed a threshold assessment grid, a one-page assessment of mental health severity, which was then attached to the referral form/letter. Implementation was low and the grid was used with only 25% of referrals. There were no significant differences between trial arms ($p = 0.05$) for any of the comparisons: appropriateness of referral was 64% versus 60% (intervention vs. control, $p = 0.41$ adjusted), rating of urgency was 81% intervention versus 76% control ($p = 0.15$), identification of appropriate professional was 89% intervention versus 87% control ($p = 0.46$), and time to discuss referral by mental health team was 2.08 versus 2.15 minutes ($p = 0.37$).

Waiting list interventions

We identified three interventions that consisted of waiting list review (reviewing the condition of patients awaiting a specialist appointment to see if that appointment was still appropriate and required) or watchful waiting (delaying referral to see how a condition developed) (*Table 14*).[118–120] Only one of these interventions was shown to be effective, although all were considered to be at lower risk of bias.[118] The strength of the evidence was graded as inconsistent.

The effective intervention[118] evaluated a specialist appointment service for long-waiting patients. Letters were sent to patients who had been waiting for hospital appointments for 2 years or more (triaged by the hospital as non-urgent). Patients responded and, if they felt that the appointment was still needed, they were seen at specially arranged clinics. In the first wave 16 patients required procedures (of the 101 who

TABLE 14 Characteristics of waiting list interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
King 2001[119]	Review of waiting list	BA	UK	Any specialty	109 referrals	NR
Stainkey 2010[118]	Review of waiting list	Audit	Australia	Five specialties	872 patients	NR
van Bokhoven 2012[120]	Watchful waiting	cRCT	the Netherlands		498 patients, 63 GPs Patient mean age 43 years, 28% male GP mean age 45 years, 74% male	NR

BA, before-and-after; cRCT, cluster RCT; NR, not reported.

had responded to the letter and been seen in a clinic). In the second wave 532 patients responded to the letter and were seen in a clinic. One hundred and seventy-seven patients had surgical procedures resulting from these appointments.

Two further waiting list interventions had no effect on referral: the first[119] considered whether or not, in practices with high referral rate, an invitation to review referrals could identify patients on the waiting list who considered their referral unnecessary, leading to a negotiated cancelling of their appointment. Four to seven weeks after referral, selected patients were sent a questionnaire and an invitation to a review their appointment. Exclusion criteria were symptoms that raised the possibility of significant disease; patient's mental state precluded consent or co-operation; the referring doctor preferred the patient not to participate; and such urgency that an outpatient appointment could be expected within 3 weeks. Of those patients who were contacted, 77 (72%) responded and, of those, 10 (13% of responders) indicated uncertainty that a referral was still needed. Eight of these attended for review, but in none of these cases was the appointment subsequently cancelled. Therefore, taking cancellation of a hospital appointment as an end point, the effect shown is 0 out of 435 referrals and 0 out of 109 in the intervention group (95% CI 0 to 3).

The second study[120] evaluated the feasibility of watchful waiting compared with immediate blood test ordering in patients presenting with unexplained complaints that did not cause alarm for the GP, including fatigue, abdominal complaints, weight change, musculoskeletal complaints and itch. Group A took a watchful-waiting approach. Group B included watchful waiting plus a 'quality improvement strategy', which consisted of two small group meetings including an explanation of the diagnostic value of tests, a discussion of the difficulties in dealing with patients with unexplained complaints, and goal setting to change GPs' behaviour. There was no statistically significant difference between the two intervention groups in terms of the number of patients for whom tests were ordered, or GP performance (performs adequate examination, explains findings to patient). First consultation GPs ordered a mean of seven tests in the control group and trained intervention group, and six tests in the untrained intervention group. Fifty-two of the 498 patients returned to the GP after 2 weeks for a further consultation.

System change interventions

We defined system changes as large changes impacting on all referrals made which involved the movement of staff or relocation clinics, the methods in which all referrals were triaged at hospital or financial arrangements for referrals.

System change interventions included the community provision of specialist services by GPs ($n = 9$), outreach or community provision by specialists ($n = 10$), return of inappropriate referrals ($n = 2$), the provision of additional primary care staff ($n = 3$), the addition or removal of gatekeeping systems ($n = 4$), changes to payment systems ($n = 4$), and referral management centre or other major triage systems ($n = 6$).

Community provision of specialist services by general practitioners

Community provision of specialist services by GPs was reported in nine studies (*Table 15*).[121–129] The services provided included dermatology services delivered by primary care, ambulatory electrocardiogram (ECG) monitoring in general practice, GP providing minor surgery, a GP headache service, GP with special interest (GPwSI) clinics in primary care, spirometry, and loop electrical excision procedure (LEEP) for cervical dysplasia. Seven studies showed a positive effect on referral outcomes, but two reported a negative effect or no effect. Eight studies were considered to be at lower risk of bias,[121–128] with only one study at higher risk of bias (this study showed no effect on referral outcomes).[129] The strength of the evidence was graded as stronger.

Seven studies showed a positive association between the intervention and referral outcomes.[121–127]

The first from the USA[121] evaluated whether or not LEEP training for family physicians could impact on referral to gynaecology. Prior to training all patients were referred. After training, the LEEP for cervical

TABLE 15 Interventions of community provision of specialist services by GPs

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size	Study duration (follow-up)
Callaway 2000[121]	LEEP training for GPs	Audit	USA	Gynaecology	272 patients; female	(6 years)
Levell 2012[129]	**Dermatology clinics**	**BA**	**UK**	**Dermatology**	**NR**	**6 years**
Ridsdale 2008[124]	GPwSIs in headache	Audit	UK	Neurology	117 patients Mean age 41.1 years, 57% female	NR
Rosen 2006[128]	GPwSIs	Cohort	UK	All specialties	Four sites	NR
Salisbury 2005[125]	Primary dermatology service	RCT	UK	Dermatology	30 practices 556 patients	(9 months)
Sanderson 2002[126]	Dermatology in primary care	RCT	UK	Dermatology	556 patients	(9 months)
Sauro 2005[127]	GP spirometry	nRCT	Italy	Respiratory (COPD)	24 GPs 32,785 patients	NR
Standing 2001[122]	ECG monitoring by GPs	BA	UK	Cardiology	73 patients 26 male, 47 female 71% no cardiac history	NR
Van Dijk 2011[123]	Minor surgery by GPs	Audit	the Netherlands	Surgical specialties	14,202 patients Mean age 39 years; 51% female	NR

BA, before-and-after.
Bold text indicates study at higher risk of bias.

dysplasia was carried out by family physicians in a cervical dysplasia clinic. During the study period, 283 women were seen in the clinic, and 26 individuals (9%) were referred by the GP to a consulting gynaecologist. Of the 9% referred to gynaecologist, all but one were subsequently treated with a laser or a combination of a laser and LEEP.

A UK study[122] investigated whether or not ambulatory ECG monitoring in general practice could decrease unnecessary referrals and pick up unsuspected cardiac abnormalities. Patients were recruited to use a novel ambulatory ECG machine designed to detect arrhythmias in general practice. Patients were selected if they had signs and symptoms indicative of cardiac abnormalities including dizzy spells, fainting, palpitations or pounding chest, as well as considering their medical history and general profile. Patients made two GP visits. On the first they underwent a normal consultation and the GP recorded any diagnosis made, whether he or she would refer the patient and, if so, what test he or she would request. The ECG device was fitted and the patient was given a diary card and general advice about the equipment. The patient's ECG signal was then analysed for 24 hours. The patient was instructed to return to the surgery the next day where the GP reviewed the report generated by the equipment and decided whether or not to refer the patient to the cardiology clinic. Following GP assessment prior to using the ECG machine, GPs were intending to refer 49 (68%) to cardiology outpatients for further tests. Of these, three cases were

considered to need urgent appointments. The ECG data identified 22 patients with cardiac abnormalities. In seven patients no abnormality was detected, and three further cases gave non-diagnostic results (probably attributable to poor fitting). The number of patients the GPs decided to refer to cardiology outpatients reduced by 60%, from 49 to 19 patients. However, the number of patients identified as urgent increased from three to seven. Thirty-six (of 49) were unlikely to need cardiology referral.

The most recent study[123] retrospectively examined associations between the number of minor GP surgical interventions undertaken and hospital referral rates. Electronic medical record data were examined for patients where benign neoplasm skin/naevus, sebaceous cyst or laceration/cut and/or minor surgery was performed by GPs. GP practices that performed more minor surgery had a lower referral rate for patients with a laceration/cut (–0.38, 95% CI –0.6 to –0.11) and for patients with a sebaceous cyst (–0.42, 95% CI –0.63 to –0.16) but not for those with benign neoplasm skin/naevus (–0.26, 95% CI –0.51 to 0.03). Minor surgery was more often performed in older patients. The presence of a primary care nurse only affected referral for benign neoplasm. There was a significant negative correlation between minor surgery intervention and referrals at a practice level (no data given). For laceration/cut and sebaceous cysts, GP practices that perform more minor surgery interventions refer fewer patients to a medical specialist. Performing five more minor surgery interventions per 100 care episodes would result in 4.3 fewer referrals for sebaceous cyst.

Another UK study[124] evaluated the training of GPwSIs in headache and the setting up of a GPwSI clinic in general practice, compared with the existing neurology service. A questionnaire survey was conducted, measuring headache impact, satisfaction and cost estimates. There was no significant difference in headache impact between hospital (mean score 61.2, SD 10.4) and GPwSI clinic attendees (mean score 64.3, SD 9.3) after adjustment for age, sex and ethnicity (mean difference 2.7, 95% CI 1.6 to 7.0). Patients were significantly more satisfied with the GPwSI service, particularly that the service was effective in helping to relieve their symptoms (89% vs. 76%; OR 7.7, 95% CI 2.7 to 22.4). The cost per first appointment was estimated to be £136, with £68 for subsequent contacts. These are lower than costs for neurologist contacts.

A further study from the UK[125] investigated the effectiveness, cost-effectiveness, accessibility and acceptability of a primary care dermatology service (PCDS) in comparison with a hospital outpatient clinic for dermatology. The PCDS was staffed by two GPwSIs and a specialist nurse, and provided from a suburban health centre. Patients were referred by their GPs to the outpatient dermatology department as usual. Those who appeared on the basis of their referral letter to be suitable for management in the PCDS were given an appointment there rather than at the outpatient department. There were no marked differences between the PCDS and hospital care in respect of clinical outcome (ratio of geometric means 0.99, 95% CI 0.85 to 1.15; $p = 0.9$, adjusting for baseline and stratification). The PCDS was more accessible [the difference between means on the access scale (scored out of 100) was 14, 95% CI 11 to 19; $p < 0.001$] and patients had reduced waiting times by a mean of 40 days (95% CI 35 to 46 days, $p < 0.001$). Fewer PCDS patients (6%) than hospital patients (11%) failed to attend their initial appointment, but overall did-not-attend rates for new and follow-up appointments were similar in both sites (PCDS 8%; hospital 11%). Of those patients seen initially at PCDS, 12% were referred to the hospital for one or more follow-up appointments.

The fourth UK study in this group[126] assessed the effectiveness, accessibility and acceptability of a GPwSI service for skin problems compared with a hospital dermatology clinic. The GP clinic was staffed by two GPwSIs and a specialist nurse. A consultant dermatologist provided clinical support for two sessions per month. No noticeable differences were found between the groups in clinical outcome (median dermatology life quality index score of 1 both arms, ratio of geometric means 0.99, 95% CI 0.85 to 1.15). The GPwSI service was more accessible (difference between means on access scale 14, 95% CI 11 to 19) and patients waited a mean of 40 (95% CI 35 to 46) days less. Patients expressed slightly greater satisfaction with consultations with a GPwSI (difference in mean satisfaction score 4, 95% CI 1 to 7), and at baseline and after 9 months 61% said that they preferred care at the service.

An Italian study[127] considered the effect of training GPs to perform spirometry on the management of COPD and asthma. There were three study groups (it is not clear if they were randomly allocated): group 1 GPs received a spirometer and practice training in its use, including information on guidelines ($n = 11,050$); group 2 received only guidelines (no spirometer or training) ($n = 11,040$); and group 3 was the control group ($n = 1049$). COPD was diagnosed in 5.8% of group 1, 1.5% of group 2 and 2.3% of group 3 ($p < 0.001$). Group 1 performed the test in 65.7% cases of COPD or asthma. Group 2 referred 7.8% of patients. The control group requested the test in 96.8% of the cases. There were significant differences between prescribing and/or utilising spirometry between all three groups ($p < 0.001$, data not given). Group 1 referred 7.5% to a specialist and diagnosis was confirmed in 91.8% of cases. Group 2 sent 7.8% to the specialist and diagnosis was confirmed in 75.8%. The control group referred 96.8% of patients, of whom 27.2% only had a confirmed diagnosis.

Two other UK studies showed no association with referral outcomes (one showed a strong negative effect on referral numbers).[128,129]

The first[128] compared referrals from GP practices that had access to GPwSI clinics and those that did not. They found that the association between the introduction of GPwSI clinics and hospital referral rates was variable and unpredictable. There were no significant changes in hospital referral rates following the introduction of GPwSI clinics in any of the sites studied. Overall referrals to hospital and GPwSI clinics combined increased in the three sites for which data were available. The likelihood of referral, calculated as the RR, adjusted for baseline and linear time trend, did not change after the launch of the GPwSI clinics in any of the sites studied. Small changes in risks of referral from studying control practices did not reach statistical significance. In one site, where all practices had access to GPwSI clinics, there was a significant ($p = 0.08$) 13% increase in overall referrals.

The second[129] assessed the effect of introducing dermatology integrated intermediate care services on the numbers of dermatology referrals to secondary care. The dermatology intermediate care service was set up in 2005, providing services in two locations by two GPwSIs in dermatology. The GPwSIs were supported by experienced dermatology nurses and in total six clinics weekly were held, seeing approximately 30 new patients weekly. The numbers of dermatology new patients seen in secondary care, which had been stable for 5 years, showed an increase in 2007 followed by a substantial increase in 2008 and then 2009. The mean number of new patients seen in dermatology in 2004–6 was 6927 patients per year; in 2007, the mean number was 7844 patients; and the mean number of new patients seen between 2008 and 2010 was 11,535 patients per year. This was an increase of 67% in the number of new patients seen. Overall, over this period, there was a 23% increase in new dermatology patients seen in secondary-care dermatology in England. This study was at higher risk of bias.

The majority of interventions in which GPs were trained to provide specialist services in the community were effective at preventing referrals to secondary care. The two studies which did not show a positive effect consisted of GPwSIs rather than GPs who were trained to undertake a specific procedure. However, three other GPwSI interventions were shown to be effective. This could not be separated by condition, as of the two GPwSIs in dermatology studies, one was shown to be effective and one was not.

Community provision by specialists

Community provision by specialists was reported in 10 studies (*Table 16*).[130–139] The interventions consisted of specialist outreach clinics for diagnosis and treatment where appropriate, development of multidisciplinary mental health teams in primary care, acupuncture in primary care, manual therapy as part of a community-based musculoskeletal service, and an outreach surgical service offering open-access endoscopy to rural areas. Of the 10 studies, eight reported positive effects,[130–137] with two reporting a negative effect or no effect[138,139] (including one at higher risk of bias[139]). Nine of the studies were considered lower risk for bias,[130–138] and the strength of the evidence was graded as stronger.

TABLE 16 Interventions of community provision by specialists

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Campbell 2003[131]	Specialist outreach clinic	cRCT	UK	Cancer genetics service	203 GPs Women: family breast cancer	NR
Felker 2004[132]	Multidisciplinary mental health team	BA	USA	Mental health	9656 patients Mean age 53 years; 90% male	2 years (1 year)
Gurden 2012[133]	Community musculoskeletal service	BA	UK	Musculoskeletal	696 patients Back or neck pain Mean age 52 years; 66% female	(≈8 weeks)
Hermush 2009[137]	Caring for the elderly in the community	BA	Israel	Geriatrics	512 patients Mean age 79 years; 66% female	(3 years)
Hughes-Anderson 2002[136]	Outreach endoscopy	BA	Australia	Endoscopy	4400 patients Mean age 50.8 (15–94) years; 45% female	5 years
Johnson 2008[139]	**Acupuncture in primary care**	**Audit**	**UK**	**Acupuncture**	**109 practices**	**NR**
Leiba 2002[130]	Specialist outreach clinic	nRCT	Israel	All specialists	136 patients; 20 GPs	NR
Pfeiffer 2011[138]	Primary mental health services	Audit	USA	Mental health	49,957 patients Mean age 55.7 years; 93% male	NR
Schulpen 2003[134]	Joint consultation sessions	nRCT	the Netherlands	Rheumatology	17 GPs Mean age 48.5 years, 12% female	2 years
Vlek 2003[135]	Joint consultation sessions	RCT	the Netherlands	Cardiology	49 GPs 13 cardiologists 306 patients; mean patients age 58 years	1 year

BA, before-and-after; cRCT, cluster RCT.
Bold text indicates study at higher risk of bias.

A study from Israel[130] evaluated a specialist outreach clinic established in a home-front military primary-care clinic. Patients were initially referred, but no further referral was required for continuity of specialist care. The same analysis was applied to a similar clinic employing only GPs, which refers to military specialist centres or hospital outpatient clinics. The incorporation of specialists did not result in a significant increase in the overall consumption of medical services ($p < 0.05$). It reduced the number of referrals out of the clinic to specialist centres from 1449 to 421 per month ($p < 0.05$). In the control clinic, referrals to distant specialist centres and outpatient clinics showed a slight and non-significant increase. Number of work-days lost was reduced from 2891 days per month to 1938 days per month ($p < 0.001$). The total cost of all medical interactions and referrals did not significantly increase after the introduction of the outreach specialist clinic ($p < 0.05$). Primary physicians graded their satisfaction with the new clinic as 4.5 (out of 5).

Campbell *et al.*[131] evaluated specialist outreach clinics in rural Scotland. Women with a family history of breast cancer were referred to a clinic held in a community setting near to the GP practice rather than receiving an appointment to see a consultant geneticist and breast surgeon at a regional centre. Referral rates rose from 2 years before the trial to during the trial (0.21 to 0.31), a 48% increase in referral rate ($p < 0.001$). Forty-three per cent of women asked to be referred and younger women were more likely to have taken the initiative to request referral ($p = 0.001$). There was a substantially greater increase in referral rates to community clinics than to the regional centre (64% increase vs. 38% increase), suggesting that providing a service in the community resulted in a change in GP referral behaviour. This was particularly apparent in practices in relatively deprived communities. There were higher referral rates from practices with more female partners before and during the trial ($p < 0.005$ and $p < 0.02$).

A study from the USA[132] evaluated the effect of a multidisciplinary mental health care team in primary care. A multidisciplinary mental health team was created consisting of a psychologist, a psychology intern, psychiatry residents, clinical social workers and a chaplain. Before implementation 543 consultations occurred over the year. Of these, 543 (38%) were subsequently referred to specialty mental health care services. The following year, 560 consultations occurred, but only 81 (14%) were referred. The change in referral rate was significant ($\chi^2 = 77.85$, df = 1; $p < 0.001$).

The most recent study[133] evaluated a community-based musculoskeletal service. Patients still having pain after 4–6 weeks of 'usual GP care' were offered a course of manual therapy and referred to a private provider of their choice for chiropractic, osteopathy and physiotherapy services. The percentage change in scores from baseline to discharge were as follows: Bournemouth Questionnaire, 64.6% patients categorised as improved; Bothersomeness scale, 69.9% patients categorised as improved; and Global Improvement Scale, 67.8% patients categorised as improved. Overall, 99.5% were satisfied or very satisfied with the treatment and only 3% were referred back to the GP with a recommendation for referral to secondary-care services (97% were given self-management advice and recommended for discharge).

Schulpen *et al.* from the Netherlands[134] evaluated joint consultation sessions between GPs and a consultant held 6-weekly which consisted of three GPs and one visiting rheumatologist at the practice of a host GP. The GPs presented each patient, and the consultant examined the patient and formulated a diagnosis and therapy policy together with the GP. Prior to intervention there was an increasing referral rate to the hospital rheumatology department. By the end of the study period, the number of patients referred by each GP per year differed by –62% in the intervention group, compared with the controls. The average reduction in referral rate to rheumatology was –2.8 (SD 3.9) at the end of the second year of the intervention period, compared with the first year in the intervention group. In the control group the referral rate difference was zero (SD 2.1). The difference in referral rate between the intervention and control groups both before and after the intervention was significant ($p = 0.024$, Mann–Whitney *U*-test). Based on referral rates prior to the intervention, if all patients had been referred to a normal outpatient clinic they would have taken 307.8 hours of consultant time. If all referrals during the study period had been seen via the joint clinic system this would have used 166.7 hours. The authors argue that there was, therefore, a decrease of 46% in time spent by rheumatologist consultants.

A second study from the Netherlands in this group[135] evaluated monthly joint consultation sessions between GPs and cardiology specialists held over 18 months in the surgery of the GP. Three to four patients could be examined and discussed at each session and there were an average of seven sessions per GP (range 2–13 sessions per GP). Fewer patients in the intervention group than the control group were referred to a cardiologist (33% vs. 52%, $p = 0.001$). The difference in referral rates showed an average decrease of referrals to cardiology of 6 per 1000 patients in the GPs from the intervention group. Further diagnostic procedures were required for 7% in the intervention group versus 16% in control group ($p = 0.013$).

Hughes-Anderson *et al.*[136] assessed whether or not an Australian outreach surgical service offering open-access endoscopy to rural areas was being overutilised. Indications for referral between the GPs and the visiting surgeons were reviewed in patient records and assessed for compliance with guidelines. Two groups of patients were defined: those referred directly for open-access endoscopy and those selected by the surgeons. A total of 772 endoscopies were performed and 75% were booked as open-access services. The referral rate for procedures was greater for GPs (583: 75%) than for the visiting surgeons (189: 25%). The overall compliance rate for approved indications using the guidelines for both groups was 92%. There was no significant difference in pathology found between groups. The difference between GPs and visiting surgeons for the number of appropriate indications for endoscopy was 3.2% (95% CI 1.8% to 8.2%; $p = 0.348$, not significant). The difference between GPs and visiting surgeons (appropriate indications) for colonoscopy was 6.8% (95% CI 1.8% to 15.4%; $p = 0.148$, not significant).

A study from Israel[137] evaluated a new model used in caring for the elderly in the community. GPs referred difficult or complex cases to a geriatrician who carried out a clinic in the same primary-care location. Referrals to a geriatrician increased significantly from 133 at baseline to 207 2 years later ($p = 0.01$). The number of visits to GPs decreased in the 6 months following the consultation with the geriatrician ($p < 0.01$).

Two further studies did not show clearly positive association with referral outcomes: the first[138] determined whether or not the implementation of primary care mental health services is associated with differences in specialty mental health clinic use. The US Veterans Health Administration is a primary care mental health service providing collocated collaborative mental health specialists and managers for screening and managing common mental health conditions (e.g. depression or alcohol misuse). Initiation of treatment at the specialty mental health clinic did not differ between primary-care services with mental health facilities and those without (5.6% vs. 5.8%). Attendance at a primary-care service for mental health was not a predictor of total number of specialist mental health clinic visits.

The second study, from the UK,[139] evaluated the provision of acupuncture in primary care and whether or not it resulted in a reduced need for referral to secondary care. They found 'no evidence from the data that provision of acupuncture is associated with lower referral rates'. The data presented outline mean referral rates for practices providing acupuncture clinics and 'some' versus 'higher' numbers of acupuncture appointments, but not for practices with no acupuncture, so this conclusion may need modification. They also report a wide variation between different PCTs, possibly associated with local differences in referral patterns and sociodemographic characteristics. This study was at higher risk of bias.

Return of inappropriate referrals

Interventions consisting of the return of inappropriate referrals were reported in two UK studies (*Table 17*).[18,140] The interventions consisted of a restricted-referral guideline issued to GPs for dermatology, including a list of conditions for which the dermatology service would no longer see patients, and a clinic returning patients referred for erectile dysfunction to the referrer (either in writing or by telephone). Both studies showed positive effects, with one at lower risk[18] and the other at higher risk of bias.[140] The strength of the evidence was graded as weaker.

TABLE 17 Characteristics of interventions of referral returns

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Tan 2007[140]	**Refuse referral for certain conditions**	**Audit**	**UK**	**Dermatology**	**NR**	**NR**
Wylie 2001[18]	Return of referrals for erectile dysfunction	Audit	UK	Erectile dysfunction	796 referrals	NR

NR, not reported.
Bold text indicates study at higher risk of bias.

The first study[18] compared the prescribing pattern and attitude of GPs in response to a clinic returning a patient referred for erectile dysfunction with the referrer by two different methods. Referrals on a waiting list for an assessment of erectile dysfunction were reviewed and a subgroup of patients was identified who had criteria enabling them to be eligible for a prescription under the NHS. The GP was informed either in writing or by telephone that the clinic had written to the patient, suggesting that he make direct contact with his GP. The long waiting time for assessment had led to 35% of patients having already tried drug therapy, and by the time the questionnaire was completed, 57% of patients had tried drug therapy. Ten times as many referrers indicated that they were happy to initiate a prescription for drug therapy than not to do so, for those men eligible for an NHS prescription. More GPs who had received a letter returned the completed questionnaire (80%) than those who had received a courtesy telephone call (64%). There were no differences between the groups of GPs in their attitude to contact with their patient and no difference in prescribing pattern.

The second study[140] evaluated the impact of a restricted-referral guidance issued to GPs for dermatology referrals inspired by the Oregon Health Plan, a rationing policy. A list of conditions that the service would no longer treat or treat only in exceptional circumstances was circulated to all GPs. Referrals for these conditions were returned. Following the introduction of the new policy, a reduction in the rate of referrals occurred. For a further 3–4 years post intervention the volume of new referrals remained static. The data are presented only in the form of a chart; there was a peak of 800 new referrals per year before the intervention, falling to around 600 referrals per year post intervention. This study was at higher risk of bias.

Additional primary care staff

Three studies reported on the provision of additional primary care staff: primary care nurses, and counsellors (*Table 18*).[141–143] However, all showed no effect (or very limited effect) on referral outcomes, with one graded as being at higher risk of bias[143] and the other two being graded as lower risk.[141,142] The strength of evidence was graded as stronger, but it is important to note that the evidence was in a negative direction here, that is, more staff adversely impacted on demand management outcomes.

A study from the Netherlands[141] assessed whether or not the introduction of primary care nurses affected referral rate for diabetes-related hospital treatment (referrals to internists, ophthalmologists, cardiologists or mental health care). Referral rate to internists for newly diagnosed patients decreased for practices both with and without a practice nurse between the two time points (7.3% vs. 3.3%). The trend in referral patterns to internists for known diabetic patients was lower in general practices with primary care nurses than those without (OR 0.59, 95% CI 0.31 to 1.11; $p < 0.1$). The number of diabetes-related contacts did not differ between practices with and without primary care nurses.

The first of two UK studies[142] evaluated the impact of counsellors in primary care on referrals to mental health services. A counsellor was present at 20.3% of practices. A random sample of 180 referrals to community mental health teams was reviewed: 76 (42.2%) from practices that employed a counsellor and 104 (57.8%) from practices that did not. There was a significantly higher referral rate from practices that

TABLE 18 Interventions of additional primary care staff

Study (first author and year)	Intervention	Design	Country	Specialty/ treatment	Sample size and details where provided	Study duration (follow-up)
Simpson 2003[143]	**Counsellors in primary care**	**BA**	**UK**	**Mental health**	**85 practices**	**8 years**
Van Dijk 2010[141]	Primary care nurses	Audit	the Netherlands	Diabetes referral to internists, ophthalmologists, cardiologists or mental health care	54 practices 751 patients; 50% male; mean age 61 years	NR
White 2000[142]	Counsellors in primary care	Cross-sectional	UK	Mental health	180 referrals	NA

BA, before-and-after; NR, not reported.
Bold text indicates study at higher risk of bias.

employed a counsellor ($p = 0.003$). However, there was no evidence of a difference in rates of appropriateness of referrals between practices that employed a counsellor and those that did not.

The second UK paper[143] also investigated the effect of employing counsellors in general practice on referral rates to mental health services. The practice-employed counsellors were well established and practices were allocated 6–12 hours per week. The findings suggest that the cost of the counsellor could be offset elsewhere. The provision of counselling had no statistically significant effect on referrals or the volume and cost of prescribing.

Gatekeeping systems

Interventions that involved the addition or the removal of gatekeeping systems (primary-care control of hospital referral) were reported in four studies (*Table 19*).[144–147] In two studies (by the same author),[145,146] multispecialty primary-care gatekeeping was removed so that patients were able to schedule an appointment directly with any specialist. The other two studies[144,147] compared open-access with physician-approved referral. Overall, the studies showed no significant effect (or only a borderline significant effect) on referrals irrespective of whether gatekeeping was added or removed in the intervention. One study was at higher risk of bias,[146] with the other three being rated as lower risk of bias.[144,145,147] The strength of the evidence was rated as stronger; however, it is important to note the bidirection of evidence and that all studies were from the USA.

TABLE 19 Characteristics of gatekeeping interventions

Study (first author and year)	Intervention	Design	Country	Specialty/ treatment	Sample size and details where provided	Study duration (follow-up)
Ferris 2001[145]	Removal of gatekeeping	BA	USA	All specialists	59,997 patients Mean age 41.7 years, 53% female	6 months
Ferris 2002[146]	**Removal of gatekeeping**	**BA**	**USA**	**All specialists**	**59,952 patients**	**NR**
Joyce 2000[147]	Open access vs. gatekeeping	Audit	USA	All specialists	53,011 patients, working age	2 years
Schillinger 2000[144]	Open access vs. physician approved	RCT	USA	All specialists	2293 patients	1 year

BA, before-and-after; NR, not reported.
Bold text indicates study at higher risk of bias.

The first paper[144] evaluated the effect of open-access versus physician approval of referral to specialist services (and to emergency departments). Intervention patients required prior approval from their primary-care physician in order to receive specialty care at the local hospital. A computer programme blocked the scheduling of unapproved appointments for these patients. Primary-care physicians were required to complete a consultation form including clinical information and number of visits requested prior to the unlocking of the system. For control patients, physician approval was not required prior to accessing services, and both self-referral or physician referral were permitted. Intervention patients decreased specialty use by 0.57 visits per year more than control patients (95% CI –1.05 to –0.01; $p = 0.04$). The intervention group increased primary-care use; however, this change was not significant. Changes in patient satisfaction with care, perceived access to specialists and use of services were similar between the two groups.

The second paper[145] evaluated the elimination of a gatekeeping system. The need for referral from a primary-care provider was removed and patients were able to call and schedule an appointment with any specialist in the group. Rates of visits to specialists were stable during the baseline period and during the intervention period. However, first visits to specialists increased slightly from 0.19 to 0.22 per patient per 6-month period ($p < 0.001$). The average proportion of visits to eligible specialists as a percentage of all visits was 29% during the year before the removal of gatekeeping and 29.6% during the year afterwards ($p = 0.39$).

The third paper[146] also evaluated the elimination of a gatekeeping system in a separate population. Elimination of gatekeeping was not associated with changes in the mean number of visits to specialists (0.28 visits per 6 months before and after gatekeeping was removed), or the percentage of all children visits to specialists (11.6% vs. 12.1%, 95% CI 29.4% to 31.8%, vs. 11.8% to 12.4%). However, new patient visits to specialists by children with chronic conditions as a percentage of all specialist visits increased from 28.1% (95% CI 25.9% to 30.2%) to 32.2% (95% CI 30.1% to 34.5%). This study was at higher risk of bias.

The fourth paper in this group[147] assessed utilisation of visits to primary-care physicians and to specialists in two different managed care models: a closed-panel gatekeeper model and an open-panel point-of-service model. Both plans shared the same physician network. There were more annual visits to primary care and a greater number of total physician visits in the gatekeeper model than in the point-of-service plan. However, there was no difference in rates of specialist visits between the systems.

Payment systems

Changes to payment systems were reported in four studies (*Table 20*).[148–151] The system changes were described as (1) change from a contract system (whereby the GP receives a fixed practice allowance plus charges fee per item to each patient) to a capitation system where GP income is based on the number of patients on their list; (2) all GPs regardless of training or practice location receive higher Medicare rebates to complete GP mental health plans and for mental health consultations; (3) replacing separate remuneration systems for publicly insured patients (capitation) and privately insured patients (fee-for-service) with a combined system of capitation and fee-for service for all; and (4) introducing a co-payment system – patient payment for attending specialist consultation. One study showed a positive effect on referral outcomes, with three studies showing a negative/no effect. One study was graded as being at higher risk of bias[151] (with the other three being judged as lower risk of bias[148–150]). The strength of the evidence was graded as inconsistent, with none of this group reporting UK data.

McGarry *et al.*[148] examined changes in patient management and referral for care following the Better Outcomes in Mental Health Care (BOiMHC) programme initiative in Australia. The BOiMHC programme allows all GPs to refer patients for psychological health care under Medicare. GPs working in accredited practices who had completed accredited mental health training were able to receive service incentive

TABLE 20 Characteristics of payment system interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Iversen 2000[151]	**Payment system for GPs**	**Economic analysis**	**Norway**	**All specialties**	**150 GPs**	**NR**
McGarry 2009[148]	Government spending on mental health	Audit	Australia	Mental health	44 GPs	5 years
Van Dijk 2013[149]	Changes to payment systems	BA	the Netherlands	All specialties	39,828 patients, 52 GPs	7 years
Vardy 2008[150]	Copayment system	Audit	Israel	All specialties	3745 patients, 48 GPs GPs: 54% female, mean age 45.5 years	NR

BA, before-and-after; NR, not reported.
Bold text indicates study at higher risk of bias.

payments for providing care to patients with *International Classification of Diseases*, Tenth Edition (ICD-10)-diagnosed mental illness. All GPs regardless of training or practice location receive higher Medicare rebates to complete GP mental health plans for patients with ICD-10-diagnosed mental illness, as well as higher rebates for mental health consultations. Significantly higher rates of referral for psychological treatments were reported in 2006 than in 2002. Significantly higher proportions of responders in 2006 reported referring half or more of their patients with mild to moderate depression ($p < 0.001$) for cognitive–behavioural therapy ($p < 0.001$).

A study from the Netherlands[149] investigated the effects of replacing separate remuneration systems for publicly insured patients and privately insured patients with a combined system of payment. Guideline adherence increased between 2002 and 2008 by 7% for (formerly) publicly insured patients and 10% for (formerly) privately insured patients. In general, there were no significant differences in the trends for guideline adherence between privately and publicly insured patients, indicating the absence of an effect of the remuneration system on guideline adherence.

Vardy *et al.*[150] evaluated a copayment system in Israel which consisted of a payment per patient for attending a specialist consultation. The payment was described only as 'a relatively low fixed sum to be paid prior to the appointment'. Attendance at planned appointments was 85% for specialist appointments in the community and 91.7% for specialist hospital appointments in the time period when copayment was in operation. There was no difference in self-referral and physician referral rates. Only 2% reported copayment as the reason for not attending, compared with 19% who stated that copayment was a reason for not attending an appointment in the past. Physicians stated that a need for copayment influenced their referral decision, especially with elderly or lower-income patients.

A Norwegian paper[151] explored whether or not a payment system for GPs has an impact on referral. The intervention consisted of a change from a contract system (whereby the GP receives a fixed practice allowance, plus charges a fee per item to each patient) to a capitation system where each person registers with a particular GP and GP income is based on the number of patients on their list. In the capitation system where GP income is determined by the number of patients on the list, the GP referral rates to specialists increased by 42%. It was hypothesised that it is less profitable for the GP to provide services themselves and more profitable for them to let the specialists provide the services.

Referral management centres

Referral management centres or other major triage systems were reported in six papers (*Table 21*).[152–157] All but one[155] reported UK studies. The interventions included two city-wide gateways for triage from general practice to specialist care, single-point referral systems for adult learning disability health services and old age psychiatry, a common pathway for all musculoskeletal referrals, and a gatekeeping and appropriateness review for diabetes referral. Three studies showed a positive effect on referral outcomes,[152–154] with three studies showing a negative/no effect.[155–157] Two of the studies that showed a positive effect were graded at higher risk of bias[153,154] (with the other four being lower risk for bias[152,155–157]), and the strength of the evidence was graded as inconsistent.

The first paper[152] evaluated the impact of introducing a multidisciplinary single point of referral (SPR) system for dedicated adult learning disability health services. They completed a retrospective case note review comparing referrals to a SPR system with those to the old referral system. The SPR system used common referral criteria and a streamlined information system. A new referral form and information leaflet were developed and copies distributed to social workers, data centre managers, GPs and colleges of further education. With the introduction of the SPR system, the mean waiting time for referral to assessment was reduced from 46 (15–67) days to 6 (2–9) days. The proportion of inappropriate referrals halved from 26% to 13%. The proportion of appropriate referrals that involved more than one dedicated learning disability health professional increased from 63% to 80%.

Whiting[153] evaluated development of a Manchester-wide referral gateway for triage from general practice to specialist care (including referrals to general surgery, ophthalmology, cardiology, ENT, trauma/orthopaedics, gynaecology, urology and dermatology). Referrals were electronically screened at three stages using a single standard referral letter template. At stage 1, GP referrals were checked for completeness (NHS number, date of birth, etc.), and checked against local non-commissioned policy. At stage 2, if data were missing, or the procedure was not commissioned, an electronic advice note was sent back to the GP practice. Stage 3 was clinical triage consisting of three outcomes: referral continues; referral diverted to an alternative service or advice and guidance from Map of Medicine, NICE or the local

TABLE 21 Characteristics of referral management centre interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size	Study duration (follow-up)
Cox 2013[156]	Introduction of referral management centres	BA (retrospective)	UK	All specialties	376,000 patients 85 practices	3 years
Ferriter 2006[157]	Single assessment process	BA	UK	Psychiatry	20 referrals	NA
Kim 2004[155]	Diabetes referral management centre	Audit	USA	Diabetes specialists	6941 patients Mean age 61 years; 54% female	(1 year)
Maddison 2004[154]	**Early access to musculoskeletal services**	**BA**	**UK**	**Musculoskeletal**	**NR**	**18 months**
Watson 2002[152]	Single-point referral system	Audit	UK	Adult learning disability services	NR	NR
Whiting 2011[153]	**Manchester referral gateway**	**Audit**	**UK**	**Eight specialties**	**Four practices**	**5 months**

BA, before-and-after; NR, not reported.
Bold text indicates studies at higher risk of bias.

commissioner; or referral sent back to the GP to encourage more work-up or increase management in primary care. The process was completed within 2 working days. There was a 1.2% reduction in outpatient activity (compared with the 3.8% growth predicted before the intervention). No further data were reported. This study was at higher risk of bias.

The third paper in this group[154] assessed the impact of a Targeted Early Access to Musculoskeletal Services (TEAMS) programme on accessibility to musculoskeletal services. The intervention established (with central clinical triage) a common pathway for all musculoskeletal referrals so that patients attended the appropriate department. A back pain pathway led by physiotherapists was developed, and GPwSIs and physiotherapists were trained to provide services for patients with uncomplicated musculoskeletal problems in the community. After the introduction of intervention, there was a major increase (116%) in the total number of referrals for musculoskeletal problems. In contrast, the number of orthopaedic referrals was slightly reduced. Over 18 months the total number of referrals more than doubled. Despite this, waiting times for musculoskeletal services fell; this was noticeable for rheumatology and pain management (primary data not given).

The only non-UK study[155] examined the effect of referral management on diabetes care by evaluating Translating Research Into Action for Diabetes (TRIAD), a multicentre US study of managed-care enrolees with diabetes. Prospective referral management consisted of gatekeeping and mandatory authorisation from the management office. Retrospective referral management consisted of referral profiling and appropriateness reviews. Referral management was commonly used by health plans (55%) and provider groups (52%). In adjusted analysis, there were no associations between any of the referral management strategies and any of the referral outcome measures.

The most recent paper[156] reported an evaluation to establish whether or not the introduction of referral management centres was associated with a reduction in hospital outpatient attendance rates. Eighty-five GP practices formed five groups to manage referrals. Two groups also carried out peer review of referrals. The referral management interventions were more complex than internal peer-review controls, involved a wider range of activities, and included activities not directly related to referral management (no further information on these differences is given). Four groups showed statistically significant increases in attendance rates, ranging from 0.41 to 1.20 attendances per 1000 persons per month. After correction, only one group (a referral management centre) remained significant (1.05 attendances per 1000 persons per month, 95% CI 0.64 to 1.64; $p < 0.005$).

The final paper in this group[157] aimed to identify changes in the quality of information in referrals to an old age psychiatry service before and after the introduction of the single assessment process. The single assessment process was introduced in response to the National Service Framework for Older People, to facilitate referrals between agencies and reduce duplication for patients, carers and clinicians. All referrals between agencies were expected to be made on designated forms. The referral form consists of several free-text sections: identity of patient and carer; identity of referrer; reason for referral; assessment of urgency; risk factors; current services provided to patient; diagnosis and recent history; current medication; and signature of referrer. Two senior clinicians performed independent and masked rating of each referral, using a five-point Likert scale. The authors report that referrals were worse in all areas of quality of referral information after implementation of the single assessment process. Word count decreased from 240 (SD 120) to 129 (SD 39) ($p = 0.005$). Time to read in seconds increased from 96 seconds (SD 40 seconds) to 124 seconds (SD 41 seconds) ($p = 0.001$). Illegible sections (% of) increased from 2 (10%) to 6 (30%) ($p = 0.011$). The number of raters who strongly agreed or agreed with the statement: 'I am able to judge the appropriateness of the referral' decreased from 19 to 5 ($p = 0.001$). 'I would need to seek further information before processing this referral' increased from 3 to 17 ($p = 0.001$). 'Overall I think the referral is useful' decreased from 17 to 3 ($p = 0.001$).

Patient-focused interventions

We found few examples of patient-focused interventions. The papers we identified comprised two evaluating the provision of health information/education, and one intervention aiming to address patient concerns and satisfaction (*Table 22*).[158–160] The first study showed no effect and was scored at higher risk of bias. The second showed a positive effect and scored lower risk of bias. The education interventions were graded as inconsistent and the small number of papers led to a strength of evidence grading as 'no evidence'.

A US study[158] determined whether or not a brief pre-visit questionnaire about referral concerns could improve primary-care provider recognition of patient concerns and satisfaction with care. Patients were given a pre-visit questionnaire about referral need and rationale and a post-visit questionnaire about referral concern and visit satisfaction. Providers were given a post-visit questionnaire asking whether a referral was discussed or made, and about visit satisfaction. In the control phase, patient pre-visit questionnaires remained confidential, whereas in the intervention phase GPs were shown the pre-visit questionnaire at the time of the encounter. The intervention significantly increased GP referral recognition from 61% to 81% ($p < 0.001$) and was associated with increased visit satisfaction ($p = 0.05$). Satisfaction of GPs with the referral discussion, overall rate of referral and visit duration was not affected by the intervention.

The first UK paper[159] investigated the effect of patient information booklets on overall use of health services. One of two booklets was posted to participants in intervention groups. Patients randomised to the control group did not receive a booklet. 'What Should I Do?' was part of a patient education programme that had been implemented in the Netherlands. The booklet outlines 40 common health problems and provides information on when to consult a doctor and when self-care is appropriate. The 'Health Care Manual' was developed by a GP and a practice nurse in Scotland. It outlines 50 common health problems and also provides information about keeping healthy. Receipt of either booklet had no significant effect on health service use, compared with the control group (difference 0.14, 95% CI –0.18 to 0.45).

Lyon *et al.*[160] conducted a UK intervention which involved local people working in partnership in their communities to raise awareness of cancer symptoms and promote early presentation. The teams worked with primary care, with other statutory organisations and with the voluntary sector. The specific contribution of the local people was in the identification of hard-to-reach groups and the tailoring of effective health messages. Interim results showed an increase in the number of urgent 2-week referrals and the proportion of new cancer cases diagnosed through the urgent 2-week referral route (from 43% to 51%) for all breast, lung and bowel cancers. These results were statistically significant for the bowel cancer

TABLE 22 Characteristics of patient-focused interventions

Study (first author and year)	Intervention	Design	Country	Specialty/treatment	Sample size and details where provided	Study duration (follow-up)
Albertson 2002[158]	Recognition of patient concerns	BA	USA	All specialists	12 GPs 495 patients	NR
Heaney 2001[159]	**Patient information booklets**	**RCT**	**UK**	**All specialists**	**4878 patients** **20 GPs**	**12 months**
Lyon 2009[160]	Raising community awareness	BA	UK	Cancer	NR	12 months

BA, before-and-after; NR, not reported.
Bold text indicates study at higher risk of bias.

($\chi^2 = 22.193$, df = 1; $p < 0.001$) and lung cancer pathways ($\chi^2 = 8.886$, df = 1; $p = 0.003$). There was also an increase in the proportion with no spread at the time of diagnosis for bowel cancer (38% to 43%) and breast cancer (41% to 44.5%), but these results did not reach statistical significance.

Intervention outcome measures

In addition to synthesising the evidence by intervention type, we examined the main outcome measures reported in each intervention study (*Table 23*). As with the types of interventions outlined above, we evaluated the strength of evidence which supported interventions having an effect on this range of outcomes (see *Figure 2*). The outcomes reported in the literature were as follows.

1. Referral outcomes ($n = 62$). These were outcomes that related to measuring the number of referrals which had been made. The specific outcomes reported by individual papers included referral, number of referrals/number of patients referred, change/differences in referral rates, referral to a particular specialty, referred back to GP with recommendation for referral to secondary-care services, achieving target referral levels and referrals avoided. These measures were usually used in a context in which a reduction was the target of the intervention. However, there were some instances where an intervention aimed to increase referrals (e.g. early diagnosis and referral).
2. Attendance rate/service use outcomes ($n = 18$). These outcomes related to use of specialist services as a result of referrals from primary care. Very often this outcome measure was reported in the absence of a more direct measure of referral. The specific outcomes reported by individual papers were described as service use; attendance rate; new visits to the clinic; number of patients requiring a clinic appointment; appointment cancellation; admission avoidance/readmission; non-attendance; and self-reported visits to specialist. This measure could be used in both a positive and a negative way, in that an increase in attendance could be the target outcome (decreasing non-attendance), or, conversely, a decrease in service use could be the anticipated effect.
3. Appropriateness of referral outcomes ($n = 24$). These outcomes relate to measuring the amount or proportion of referrals considered to be 'appropriate'. Both adequacy of referral (suitable level of urgency and timing) and accuracy of referral (patients referred to the most suitable place) were considered. Most outcome measures were described simply as the amount or proportion of appropriate referrals, but others were also described as the number of inappropriate referrals, quality of referral, proportion of GPs making the correct referral decision, proportion correctly referred, and proportion of asymptomatic referrals. This outcome measure reportedly has some limitations in that consideration of appropriateness could vary between practitioners.
4. Referral quality outcomes (adequate referral information provided) ($n = 10$). These outcomes included measures of the quality of information provided in the referral. The outcomes were focused on whether or not the information provided by the GP to the specialist was adequate for the specialist's needs. The outcomes were described in the individual studies as referral quality, referral letter quality, referral letter content, the quality of the referral information, relevant information in the referral, impact of the information provided and referral communication.
5. Appropriate actioning of referral ($n = 10$). These outcomes related to guidelines and measured compliance with, or adherence to, referral guidelines. Individual studies described outcome measures as compliance/concordance with guidelines, proportion of referrals meeting guidelines, adherence to care suggestions, number of requests for treatment/appointments, and GP/specialist agreement. As with the appropriateness of referral outcome (above), this measure has some limitations owing to variations in judgements of what is considered appropriate.
6. Waiting time ($n = 8$). These outcomes included all measures of time from the GP making the referral to some subsequent point in the diagnostic process. Most frequently, this was the time from the GP making the referral to the patient seeing the specialist for the first time. Individual papers described the outcomes as waiting time, time from presentation to referral appointment, waiting time from referral to appointment, time from referral to diagnosis, time to diagnosis and speed of referral.

TABLE 23 Classification of outcomes reported

Primary outcome	Studies reporting positive effect on outcome (first author and year)		Studies reporting no effect on outcome (first author and year)		Strength
	Controlled study/RCT/cRCT/nRCT/CBA	Other	Controlled study/RCT/cRCT/nRCT/CBA	Other	
Referral	Bridgman 2005,[70] Julian 2007,[62] Kerry 2000,[59] Ramsay 2003,[27] Salisbury 2005,[125] Sauro 2005,[127] Schulpen 2003,[134] Shaw 2006,[77] Vlek 2003,[135] Wolters 2005,[36] Wright 2006[56]	Albertson 2002,[158] Callaway 2000,[121] Campbell 2003,[131] **Cooper 2012,[19]** Cusack 2005,[43] Elwyn 2007,[55] Glaves 2005,[57] Gurden 2012,[133] Hands 2001,[34] Hermush 2009,[137] **Hockey 2004,[91]** Kim 2009,[98] **Knol 2006,[90] Lam 2011,[25] Levell 2012,[129] Maddison 2004,[154]** McGarry 2009,[148] McKoy 2004,[89] Simpson 2010,[78] Standing 2001,[122] Stoves 2010,[103] Suris 2007,[35] **Tan 2007,[140]** Thomas 2010,[80] **Twomey 2003,[42]** Van Dijk 2011,[123] Whited 2002[87]	Bhalla 2002,[37] Campbell 2003,[131] Dhillon 2003,[82] Dey 2004,[66] Engers 2005,[67] Lester 2009[39]	Emmerson 2003,[40] Gough-Palmer 2009,[84] **Iversen 2000,[151]** Johnson 2008,[139] Joyce 2000,[147] Magill 2009,[115] Matowe 2002,[50] Potter 2007,[46] Rosen 2006,[128] **Rowlands 2003,[26] Simpson 2003,[143]** Van Dijk 2010,[141] White 2000[142]	iii
Attendance rate	Leiba 2002,[130] Schillinger 2000,[144] Wallace 2004,[94] Whited 2002[87]	Harrington 2001,[93] Khan 2008,[71] Stainkey 2010,[118] **Whiting 2011[153]**	Eley 2010,[83] Heaney 2001[159]	Cox 2013,[156] Ferris 2001,[145] Ferris 2002,[146] Kim 2004,[155] King 2001,[119] Pfeiffer 2011,[138] **Sved-Williams 2010,[72]** Vardy 2008[150]	iii
Appropriateness of referral	Banait 2003,[53] Bennett 2001,[30] Donohoe 2000,[31] Griffiths 2006,[58] Junghams 2007,[109] Walkowski 2007,[63] Watson 2001,[32] Wong 2000[81]	Akbari 2012,[110] Chen 2010,[100] Evans 2009,[21] Hughes-Anderson 2002,[136] Imkampe 2006,[47] Kim-Hwang 2010,[102] Knab 2001,[112] Lucassen 2001,[45] Watson 2002[152]	Ellard 2012,[38] Greiver 2005,[114] Slade 2008[117]	Hill 2000, Kennedy 2012,[106] Melia 2008,[51] Shariff 2010[28]	ii
Appropriate actioning of referral	Eccles 2001,[54] Emery 2007,[111] Robling 2002,[60] Thomas 2003[79]	**Malik 2007,[41]** Mariotti 2008,[113] Van Dijk 2013[149]	Julian 2007,[62] Tierney 2003[116]	Cusack 2005[43]	i
Adequate referral information provided	Jiwa 2004, Jiwa 2012,[105] Kousgaard 2003,[29] McGowan 2008,[107] Gandhi 2008[101]	Idiculla 2000,[44] White 2004[61]	Jiwa 2006[68]	Ferriter 2006,[157] West 2007[52]	i
Waiting time	Leggett 2004,[85] Morrison 2001,[64] Wong 2000[81]	Dennison 2006,[99] Hemingway 2006,[73] **Tadros 2009,[96]** Watson 2002[152]		McNally 2003[74]	i

continued

TABLE 23 Classification of outcomes reported (*continued*)

	Studies reporting positive effect on outcome (first author and year)		Studies reporting no effect on outcome (first author and year)		
Primary outcome	Controlled study/RCT/cRCT/nRCT/CBA	Other	Controlled study/RCT/cRCT/nRCT/CBA	Other	Strength
QALYs/cost	Damask 2008,[76] Leiba 2002,[130] McGowan 2008,[107] Morrison 2001,[64] Robling 2002,[60] Salisbury 2005[125]	Harrington 2001,[93] Ridsdale 2008,[124] Simpson 2010[78]	Tierney 2003[116]	Rosen 2006,[128] Spatafora 2005[69]	**iii**
Satisfaction/ attitudes	Jaatinen 2002,[95] Kousgaard 2003,[29] Leiba 2002,[130] McGowan 2008,[107] **Nicholson 2006,[97]** Salisbury 2005,[125] Sanderson 2002,[126] Schillinger 2000,[144] Wallace 2004,[94] Whited 2002,[87] Wong 2000[81]	Albertson 2002,[158] Gurden 2012,[133] Harrington 2001,[93] Hilty 2006,[24] **Maddison 2004,[154]** Patterson 2004,[104] Ridsdale 2008,[124] Simpson 2010,[78] Stoves 2010,[103] Suris 2007,[35] **Tadros 2009,[96]** Wylie 2001[18]	Eminovic 2009,[86] Tierney 2003[116]	Emmerson 2003,[40] Rosen 2006[128]	**i**

CBA, controlled before-and-after; cRCT, cluster RCT.
Bold text indicates studies at higher risk of bias.

7. Costs ($n = 12$). Although few papers focused specifically on the cost/cost-effectiveness of an intervention, 12 papers did report cost outcomes along with other measures. The cost-related outcomes reported included cost, cost to the NHS, cost of testing, health-care costs, cost-effectiveness, QALYs and cost saving.
8. Satisfaction/attitudes ($n = 27$). These outcomes looked at positive impacts on decision-making and patient satisfaction, and therefore include satisfaction of the patient, the referrer or both. Many studies included satisfaction outcomes as secondary measures. The specific outcomes reported were patient satisfaction, user satisfaction, satisfaction of patients and health professionals, practitioner satisfaction and GP attitude.

Non-intervention papers: immediate effects

The non-intervention papers consisted of qualitative studies and papers reporting associations. We scrutinised data from these papers and carried out additional searching to uncover any further evidence regarding the process whereby the different types of interventions we had identified may lead to change in referral outcomes. The key gaps in evidence from the intervention literature related to, firstly, the process whereby providing GP education interventions would change referral outcomes. We carried out further targeted searching to identify evidence here termed the 'clinical reasoning search'. The second gap related to the process whereby interventions that change processes and systems would impact on referral behaviours and outcomes, and additional searches for this evidence were named the 'systems search'. Full search strategies are provided in *Appendix 4*. Full extractions of these papers are to be found in *Appendix 1*.

Scrutiny of this literature identified two key sections of data, which had not been described in the intervention papers. Firstly, the literature described effects resulting from an intervention at a more immediate or micro level for individuals and, secondly, the papers described a range of predictors that may influence whether or not interventions which achieve effects in the short term lead to long-term change.

The outcomes described could be considered as measuring the 'active ingredients' in the interventions; these are the elements that would underpin the intended changed referral practice. These factors are, therefore, of importance in influencing if and how an intervention has an effect. The outcomes described in the literature were change in the doctor's or patient's knowledge, attitudes or beliefs, and change in the doctor–patient relationship (*Table 24*). As with the intervention and outcomes data, we assessed the strength of evidence underpinning these factors being associated with referral outcomes.

General practitioner knowledge

The first immediate effect of an intervention described in the literature was a change in the referrer's level or type of knowledge. Within this, a number of subfactors were categorised.

Additional training in the presenting condition

Additional training in the presenting condition (resulting in a higher knowledge level or familiarity with the patients' symptoms) was reported in 23 studies (*Table 25*).[161–183] Of these, 17 studies reported a positive association between greater knowledge of the presenting condition and better referral outcomes (including only one study at higher risk of bias,[165] the others being at lower risk of bias).[161–177] A further six studies (at lower risk of bias) reported no association.[178–183] The evidence for this association was graded as inconsistent.

Seventeen studies presented data suggesting an association between GP knowledge from training in the presenting condition and referral patterns.[161–177] Three studies suggested that GPs with training in a particular condition would refer more.[161–163] A study from France[161] presented data which suggested that

TABLE 24 Typology of immediate effects

Factor	Studies reporting association with referral outcomes (first author and year)	Studies reporting no association with referral outcomes (first author and year)	Strength
Increased GP knowledge			
Additional training in condition/knowledge level or familiarity with a condition	More referral: Delva 2011,[161] **Fucito 2003**[162] Less referral: Elhayany 2000,[167] Freed 2003,[172], Kvaerner 2007,[168] Naccarella 2008,[169] O'Neill 2005, Ringard 2010,[164] Scheerers 2007,[163] Swarzrauber 2002,[171] Townsley 2003,[165] Zielinski 2008[166] Direction unclear: Dodds 2004,[174] Knight 2003,[177] Lambert 2001,[175] Pomeroy 2010,[176] Tzaribachev 2009[173]	Jorgensen 2001,[181] Lakha 2011,[179] Montgomery 2006,[180] Rowlands 2001,[182] Rushton 2002,[183] Wassenaar 2007[178]	i
Increased knowledge of services/systems	**Angstman 2009,**[184] Coulston 2008,[187] **Kisely 2002,**[185] **Mitchell 2012**[186]		ii
Use/awareness/availability of referral guidelines	Blundell 2011,[189] **Clarke 2010,**[190] Kasje 2004,[191] Ramanathan 2011[188]	**Abel 2011,**[20] Baker 2006,[192] Bederman 2010,[196] Belgamwar 2011,[197] Jiwa 2008,[193] Ruston 2004[194] Tucker 2003,[198] Watson 2001[195]	iii
Use or awareness of specialist service quality indicators		Morsi 2012[200]	iii
Increased knowledge of patient responsiveness to treatment	**Philichi 2010,**[202] Sigel 2004[201]		ii
Changed GP attitudes/beliefs			
Confidence in management/ perceived expertise	**Anthony 2010,**[208] Bruyninckx 2009,[209] Calnan 2007,[207] Knight 2003,[177] **Moore 2000,**[205] Morgan 2007,[210] Nandy 2001,[204] Olson 2012,[206] Rosemann 2005,[211] **Steele 2012,**[203] Van der Weijden 2002,[212] Wilkes 2009[213]	**Ahluwalia 2009,**[214] Pryor 2001[215]	i
Tolerance of uncertainty/risk	**Abel 2011,**[20] Bruyninckx 2009,[209] Calnan 2007,[207] Cornford 2004,[218] Espeland 2003,[217] Franks 2000,[216] Morgan 2007,[210] Rosemann 2005,[211] Rushton 2002,[183] Van der Weijden 2002[212]	Forrest 2006[283]	i
Belief regarding peer opinion	Bruyninckx 2009,[209] Green 2008,[220] Van der Weijden 2002[212]		i
Perception of role	**Abel 2011,**[20] Calnan 2007,[207] Knight 2003,[177] Nandy 2001,[204] Young 2010[221]		i

TABLE 24 Typology of immediate effects (*continued*)

Factor	Studies reporting association with referral outcomes (first author and year)	Studies reporting no association with referral outcomes (first author and year)	Strength
Changed views of specialist service: familiarity with service/referral relationship including communication	Allareddy 2007,[232] Barnett 2011,[222] Beel 2008,[226] Berendsen 2007,[237] Chew-Graham 2008,[229] Clemence 2003,[228] Dagneaux 2012,[230] **Dale 2000,[224]** Delva 2011,[161] Forrest 2002,[223] Gandhi 2000,[108] Grace 2008,[292] Harland 2009,[231] Jorgensen 2001,[181] Kinchen 2004,[238] Knight 2003,[177] **Massey 2004,[236]** McKenna 2005,[225] **Mitchell 2012,[186]** Morsi 2012,[200] Pomeroy 2010,[176] Ringard 2010,[164] Samant 2007,[234] Sigel 2004,[201] **Taggarshe 2006,[233]** Thorsen 2012,[239] **Wakefield 2012,[227]** Xu 2002[235]	**Ahluwalia 2009[214]**	i
Changed GP referral behaviours			
Optimal time of referral	Greer 2011[240]		iii
Optimal content of referral	Gandhi 2000,[108] Jiwa 2009, Jiwa 2004, Jiwa 2012,[105] Kousgaard 2003,[29] McGowan 2008[107]	Ferriter 2006,[157] Harvey 2005[242]	i
Pre-testing and ability to triage		O'Byrne 2010[243]	iii
Changed doctor–patient interaction			
Doctor–patient relationship	Baker 2006,[192] Berendsen 2007,[237] **Carlsen 2008,[244]** Forrest 2007,[246] Hyman 2001,[248] Johnson 2011,[245] Knight 2003,[177] Nandy 2001,[204] Ramchandiani 2002,[247] Rosemann 2005[211]		i
Shared decision-making	**Carlsen 2008,[244] Clarke 2010,[190]** Knight 2003,[177] Nandy 2001[204]		i
Appropriate response to patient pressure	Calnan 2007,[207] Little 2004,[251] Morgan 2007,[210] Rosen 2007,[252] Stavrou 2009,[249] Vulto 2009[250]		i
Changed patient attitudes/beliefs			
Patient wishes/ patient pressure	Albertson 2000,[270] **Anthony 2010,[208]** Bekkelund 2001,[259] Berendsen 2007,[237] Blundell 2010,[253] Brien 2008,[258] **Dale 2000,[224]**, Davies 2007,[256] Edwards 2002,[257] Espeland 2003,[217] Forrest 2002,[223] Glozier 2007,[254] Gross 2000,[261] Knight 2003,[177] Lakha 2011,[179] Lewis 2000,[260] Little 2004[251] Morgan 2007,[210] Morsi 2012,[200] **Musila 2011,[255] Philichi 2010,[202]** Pomeroy 2010,[176] Stavrou 2009,[249] **Townsley 2003[165]**		i
Appropriate service use: number of patient visits to GP/previous referral	Albertson 2000,[270] Bertakis 2001,[264] Cohen 2013,[267] Dearman 2006,[265] Harris 2011,[268] Morgan 2007,[210] Ridsdale 2007,[266] Shadd 2011[263]	Pfeiffer 2011,[138] Vinker 2007[269]	i

Bold text indicates studies at higher risk of bias.

TABLE 25 Additional training in the presenting condition

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and participant details where reported	Response
Delva 2011[161]	Survey	France	Oncology	436 GPs 75% male	NR
Dodds 2004[174]	Survey	UK	Oncology	331 GPs; 80% practices with four or more doctors	65%
Elhayany 2000[167]	Audit	Israel	All specialties	44 GPs 67,577 patients	NA
Freed 2003[172]	Survey	USA	Juvenile RA	NR	49%
Jorgensen 2001[181]	Survey	Denmark	Physiotherapy	38,231 referrals 410 GPs	90%
Knight 2003[177]	Interviews	UK	Mental health	Nine GPs Two practices	NA
Kvaerner 2007[168]	Survey	Norway	ENT	1633 GPs	48%
Lakha 2011[179]	Survey	Canada	Pain clinic	47 GPs	32%
Lambert 2001[175]	Survey	UK	Epilepsy	312 GPs	67%
Montgomery 2006[180]	Interviews	UK	Nephrology	51 GPs	65%
Naccarella 2008[169]	Survey	Australia	Mental health	89 projects	81%
O'Neill 2005[170]	Survey	USA	All specialties	2455 GPs	NR
Pomeroy 2010[176]	Interviews/ survey	Australia	Dietitian	248 GPs (survey)	30%
Ringard 2010[164]	Survey	Norway	All specialties	3493 GPs	48–50%
Rowlands 2001[182]	Video transcript	UK	All specialties	NR	NA
Rushton 2002[183]	Survey	USA, Canada, Puerto Rico	Psychosocial services	4012 patients	NR
Scheerers 2007[163]	Survey	the Netherlands	Mental health	301 GPs	NR
Swarzrauber 2002[171]	Survey	USA	Neurology	609 GPs 1116 specialists	NR
Townsley 2003[165]	**Survey**	**Canada**	**Oncology**	**2089 GPs**	**24%**
Tzaribachev 2009[173]	Cohort	Germany	Paediatric rheumatology	132 patients	NA
Wassenaar 2007[178]	Survey	USA	Oncology	672 GPs	59.4%
Zielinski 2008[166]	Audit	Lithuania	All specialties	18 practice	NA

NA, not applicable; NR, not reported; RA, rheumatoid arthritis.
Bold text indicates studies at higher risk of bias.

GPs' attendance at a training course was associated with being more likely to refer for advanced cancer (OR = 1.85, 95% CI 1.01 to 3.38). Fucito *et al.*[162] reported that GPs who stated they regularly obtained information (training) about drug and alcohol use were more likely to refer patients for these problems ($\chi^2 = 7.0$, $p < 0.01$). Scheerers *et al.*[163] found that, in the Netherlands, GPs who received written training materials encouraging them to refer for chronic fatigue syndrome had higher referral rates.

However, nine studies suggested that GPs with training (increasing knowledge level or familiarity) in a particular condition would refer less.[164–172] The first[164] reported that frequency of GPs attending formal meetings (training) and the GPs' level of expertise were associated with lower referral rate in the Netherlands. A Canadian paper[165] reported that GPs with extra training in geriatrics and those in practice longer were likely to refer regardless of tumour stage. Zielinski *et al.*[166] reported that being a specialist in family medicine, training and experience correlated with lower referral rates in Lithuania. A study in Israel[167] found that GPs without any postgraduate training or specialty designation were likely to refer 2.5 times more often than primary paediatricians or family physicians. Kvaerner *et al.*[168] found that GPs in Norway who had received specialty training in general medicine made 6% fewer referrals than those who did not. Naccarella *et al.*[169] found that informing and training Australian GPs was the most popular demand management strategy to reduce referrals in a survey of project officers who had carried out demand management projects. The first of two US studies[170] reported that GPs who were 'board certified' (trained) were associated with lower factor referral scores. The second[171] found that GPs who preferred to manage patients without specialty involvement had higher knowledge scores than primary care physicians who preferred to refer to a specialist ($p < 0.001$). The final paper in this group[172] reported a study on referral for juvenile rheumatoid arthritis and reported that 61% of GPs referred only to confirm diagnosis and guide initial therapy.

Another five studies suggested a link between training (or obtaining knowledge) and referral, but the direction of effect was unclear. Tzaribachev *et al.*[173] reported that a statistically significant predictor of delayed referral was the primary physician's subspecialty training ($p = 0.016$). Dodds *et al.*[174] reported that GPs described that training for the 2-week wait guidance for cancer referrals created a rigid and inflexible system which did not offer scope for GP own judgement and experience. A UK study[175] found that 64% of the GPs they surveyed would welcome teaching on epilepsy. Pomeroy and Cant[176] reported that GP previous experience and knowledge of service were associated with referral. A second UK paper[177] reported that GP expertise was one of 12 'doctor-related factors' which could influence referral decisions.

There were a further six studies which reported that training in a particular condition (and the increased knowledge level, or familiarity with symptoms as a result of this) was not associated with referral. Wassenaar *et al.*[178] reported no difference in referral patterns related to those who had more or fewer patients with cancer (differing levels of familiarity with condition) in their US practice. Another North American study[179] found that the more chronic pain patients a physician saw, the less he or she tended to refer them to pain clinics, but the relationship was not significant. A third UK paper in this group[180] reported that referral rate did not differ by experience with renal patients. Jorgensen *et al.*[181] reported that the GP having frequent contact with a physiotherapist explained only a very small amount of referral variation, leaving the greatest majority of variation unexplained. Rowlands *et al.*[182] reported no alteration of practice referral rate following a UK education intervention. Rushton *et al.* carried out a survey across three countries[183] and found that providing training in behaviour management did not change rate of referral for child psychosocial services.

Increased knowledge of services or systems for referral

Increased knowledge of services or systems for referral was reported in four studies (*Table 26*).[184–187] Although three of the four studies showed a positive association between increased knowledge of services or systems and better referral outcomes, three of the studies in the group were at higher risk of bias.[184–186] The evidence for this association was, therefore, graded as weaker.

TABLE 26 Increased knowledge of services or systems

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Angstman 2009[184]	**Survey**	**USA**	**Viral specialist**	**56 GPs**	**NR**
Coulston 2008[187]	Survey	UK	Hernia surgery	86 GPs	72%
Kisely 2002[185]	**Survey**	**Australia**	**Mental health**	**74 GPs**	**45%**
Mitchell 2012[186]	**Survey/interviews**	**Australia**	**Dietitian**	**90 survey**	**20–22%**

NR, not reported.
Bold text indicates studies at higher risk of bias.

Angstman *et al.*[184] found that GPs reported that they often forgot that viral specialist consultations were an option, suggesting that increased knowledge would increase referral to the service. The first of two Australian papers[185] reported that 80% of participants found the intervention duty officer useful as a point of first contact for the consultation-liaison service. The second[186] reported that GP relationships with dieticians were believed to be the primary influencing factor on referral. The fourth study in this group[187] found that only 17% of GPs were aware of any specialist consultant surgeons in South Wales performing laparoscopic groin hernia repair. Of those who were aware, 80% had at some time referred to this service.

Greater use or awareness of referral guidelines

Greater use or awareness of referral guidelines was reported in 12 studies (*Table 27*).[20,188–198] Of these, only four showed an association with better referral outcomes[188–191] (one of which was at higher risk of bias[190]). A further eight studies showed no association between these factors (all at lower risk of bias).[20,192–198] The evidence for this association was, therefore, graded as conflicting.

Ramanathan *et al.*[188] reported greater variation in referral practice for endometrial cancer for which there are no Australian guidelines: 68% of vignettes with high probability of cancer were referred compared with 83% for ovarian cancer and 80% for cervical cancer for which guidelines are available. Blundell *et al.*[189] reported that most responding GPs indicated support for UK referral guidelines but 18% reported that they had never used them and < 3% reported use for most or all referral decisions. The odds of using guidelines decreased with increasing GP age, with a 10-year increase in age associated with halving odds of use (OR 0.53, 95% CI 0.29 to 0.90). Another UK study[190] similarly found that although there was overall support from GPs for referral guidelines, these were rarely used in practice. Kasje *et al.* [191] reported that in the Netherlands most hospital specialists relied for their prescribing on international guidelines and agreements within their own department, whereas GPs relied more on national and regional guidelines.

Another UK study[192] reported that both high and low referrers were aware of the X-ray guidelines for lumbar spine. Jiwa *et al.*[193] concluded that the application of guidelines by UK GPs is moderated by the influence of the characteristics of the patients only. Ruston *et al*[194] echoed this lack of influence of UK guidelines, finding that none of responding GPs reported using referral guidelines as they considered them to be of theoretical rather than practical relevance. A Canadian study[196] similarly found poor concordance of both predicted GP preferences and guideline recommendations with actual referral. Watson *et al.*[195] supported these limitations in their finding that, despite UK guidelines, many GPs did not know which patients warranted referral to a genetics service. Belgamwar *et al.*[197] reported that exactly half of all referrals (32/64) did not follow guidelines. Another study found that for paediatric rheumatology referrals intended management was most often referral or admission to a specialist hospital (59%, 132/224), both courses of action beyond guideline recommendations.[198] Abel and Thompson explored possible reasons underpinning this limited use of guidelines.[20] They reported that GPs perceived that rigid adherence to guidelines was inappropriate when working for the benefit of the patient.

TABLE 27 Greater use or awareness of referral guidelines

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where available	Response
Abel 2011[20]	Interviews	New Zealand	Colorectal cancer	15 GPs 11 specialists	NA
Baker 2006[192]	Interviews	UK	Lumbar spine X-ray	29 GPs 24 male	NA
Bederman 2010[196]	Delphi	Canada	Lumbar spine disease	10 GPs/specialists	NA
Belgamwar 2011[197]	Audit	UK	Anxiety/depression	Seven GPs 204 referrals	NA
Blundell 2011[189]	Survey	UK	Elective surgery	310 GPs	41.6%
Clarke 2010[190]	**Survey**	**UK**	**Elective surgery**	**324 GPs**	**40%**
Jiwa 2008[193]	Survey	UK	Lower bowel symptoms	260 GPs 50% male Aged 40 + years	52%
Kasje 2004[191]	Survey	the Netherlands	All specialties	197 GPs 34 general internists	GPs 75% Internists 50%
Ramanathan 2011[188]	Survey	Australia	Gynaecology/ oncology	140 GPs	45.5%
Ruston 2004[194]	Interviews	UK	All specialties	85 GPs 49 male	NA
Tucker 2003[198]	Interview Survey	UK	Paediatric rheumatology	171 GPs 158 midwives	68% GP 77% midwives
Watson 2001[195]	Survey	UK	Regional genetics service	50 GPs	94%

NA, not applicable.
Bold text indicates study at higher risk of bias.

Awareness of quality indicators

The use or awareness of quality indicators was reported in only one study[200] at lower risk of bias (*Table 28*) in which publicly available quality measures were found to be 'not at all important' to referral decisions. The evidence from this study was, therefore, graded as no evidence of an association between awareness of quality indicators and referral outcomes.

Knowledge of patient responsiveness to treatment

Increased knowledge of patient responsiveness to treatment/suitability for treatment was reported in two studies,[201,202] one at higher risk of bias (*Table 29*).[202] The evidence for this association was graded as weaker.

TABLE 28 Awareness of quality indicators

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where available	Response
Morsi 2012[200]	Survey	USA	All specialties	10 GPs	NR

NR, not reported.

TABLE 29 Knowledge of patient responsiveness to treatment

Study (first author and year)	Design	Country	Specialty/treatment	Sample size	Response
Philichi 2010[202]	**Survey**	**USA**	**Paediatric gastroenterology**	**237 primary care Paediatricians and nurse practitioners**	**38%**
Sigel 2004[201]	Interviews	UK	Psychological problems	10 GPs Seven male Age 38–60 years	40%

Bold text indicates study at higher risk of bias.

The first study[201] reported that referral decisions were made when GPs perceive that they have reached the limits of their capabilities for treating a problem, taking account of patient suitability for therapy and access to services. The second paper[202] suggested that the most frequently identified reason for referral was patient unresponsiveness to treatment.

General practitioner attitudes and beliefs

The following elements were identified within the category of GP attitudes and beliefs which influenced referral decision-making.

Confidence in management of the patient

Increased confidence in management of the patient, or own perceived expertise, was reported in 14 studies (*Table 30*).[177,203–215] Of these, 12 showed a positive association between increased confidence and better referral outcomes[203–213] (three of these were higher risk of bias[203,205,208]), and two showed no association between the factors[214,215] (one of which was at higher risk of bias[214]). Therefore, the evidence for this association was graded as stronger.

Steele *et al.*[203] reported that lower GP confidence in managing mental health patients was associated with referral. Nandy *et al.*[204] associated lower referral rates with GPs having an interest in mental health and having confidence in dealing with mental health. Moore *et al.*[205] found that GPs who rated themselves as comfortable with seizure patients tended to refer fewer of these patients. Olson *et al.*[206] similarly found a strong relationship between family physician referral and self-assessed or tested knowledge and confidence ($p < 0.001$ and $p < 0.010$). One of five UK studies in this group[207] reported that low referrers were more confident in their decisions and less often worried afterwards. Anthony *et al.*[208] reported that a clinician's comfort in treating depression was identified by 80% as a very important factor for referral. Bruyninckx *et al.*[209] reported that whether or not the GP was uncertain of the diagnosis was associated with referral.

A second UK study[177] reported that GPs needing advice affected referral. A further UK paper[210] reported that GP clinical confidence in identifying risks of brain tumour affected referral. Rosemann *et al.*[211] reported that GPs' experiences were more positive if their purpose was to reduce diagnostic uncertainty ($p < 0.001$) or if the purpose was to exclude serious illness ($p < 0.010$). Van der Weijden *et al.*[212] reported that GP uncertainty affected referral in the Netherlands. Wilkes *et al.*[213] found that UK GPs often reported a lack of skills or lack of confidence over infertility referrals. Ahluwalia *et al.*[214] found that having personal experience with palliative care was not statistically related to the likelihood of referral (OR 2.13, 95% CI 0.95 to 4.98). The final paper in this group[215] reported that perception of professional competency was not a barrier to referral in Australia.

TABLE 30 Confidence in management of the patient

Study (first author and year)	Design	Country	Specialty/treatment	Sample size	Response
Ahluwalia 2009[214]	**Survey**	**USA**	**Palliative care**	**145 GPs**	**85%**
				58% female	
Anthony 2010[208]	**Interviews/ survey**	**USA**	**Depression care**	**40 physicians, 15 GPs, 10 nurse practitioners**	**NA**
				27 male	
Bruyninckx 2009[209]	Survey	Belgium	All specialties	163 GPs	NA
Calnan 2007[207]	Interviews	UK	Immediate care	15 GPs	NA
				10 male	
Knight 2003[177]	Interviews	UK	Mental health	Nine GPs	NA
				Eight male	
Moore 2000[205]	**Survey**	**USA**	**Neurology**	**504 GPs**	**NR**
Morgan 2007[210]	Interviews	UK	Headache	20 GPs	50%
Nandy 2001[204]	Interviews	UK	Mental health	23 GPs	67%
Olson 2012[206]	Survey	Canada	Palliative radiotherapy	NR	33%
Pryor 2001[215]	Survey	Australia	Psychology	105 GPs	66%
				69% female	
Rosemann 2005[211]	Survey	Germany	All specialties	26 GPs	NR
Steele 2012[203]	**Survey**	**Canada**	**Psychiatry**	**847 GPs**	**24.9%**
				Remote areas	
				Male aged 41–60 years	
Van der Weijden 2002[212]	Interviews	the Netherlands	Unexplained symptoms	21 GPs	NA
Wilkes 2009[213]	Interviews	UK	Infertility	12 GPs, five specialists	NA
				13 patients	

NA, not applicable, NR, not reported.
Bold text indicates studies at higher risk of bias.

Tolerance of uncertainty and risk

Tolerance of uncertainty and risk in diagnosis and referral was reported in 11 studies (*Table 31*).[20,183,207,209–212,216–219] Of these, 10 reported a positive association between risk tolerance and better referral outcomes[20,183,207,209–212,216–218] (with only one of these being at higher risk of bias[20]). The remaining study showed no association (and was at lower risk of bias). The evidence for this association was, therefore, graded as stronger.

Franks *et al.*[216] found that greater malpractice fear was associated with greater likelihood of referral in the USA. Bruyninckx *et al.*[209] reported that referral in Belgium was affected by GP uncertainty or anxiety. A UK paper[207] reported that high referring GPs tended to express anxiety about the consequences of a decision. A paper reporting a survey across three countries[183] described defensive GP referral strategies where there was risk to the woman of not referring when breast cancer was a serious disease and risk of the patient resorting to litigation if not referred and a problem was found later. Morgan *et al.*[210] found that in the UK referral was

TABLE 31 Greater tolerance of uncertainty and risk

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details were reported	Response
Abel 2011[20]	**Interviews**	**New Zealand**	**Colorectal cancer**	**15 GPs**	**NA**
				11 specialists	
Bruyninckx 2009[209]	Survey	Belgium	All specialties	163 GPs	NA
Calnan 2007[207]	Interviews	UK	Immediate care	15 GPs	NA
				10 male	
Cornford 2004[218]	Interviews	UK	Breast cancer	20 GP/other	NA
				Surgeons, nurses	
Espeland 2003[217]	Focus groups	Norway	All specialties	14 GPs	NA
Forrest 2003[219]	Audit	USA	All specialties	139 GPs	NA
				14,709 visits	
Franks 2000[216]	Survey	USA	All specialties	173 GPs	66%
Morgan 2007[210]	Interviews	UK	Headache	20 GPs	50%
Rosemann 2005[211]	Survey	Germany	All specialties	26 GPs	NR
Rushton 2002[183]	Survey	USA, Canada, Puerto Rico	Psychosocial services	4012 patients	NR
				Children	
van der Weijden 2002[212]	Interviews	the Netherlands	Unexplained symptoms	21 GPs	NA

NA, not applicable, NR, not reported.
Bold text indicates study at higher risk of bias.

related to personal tolerance of uncertainty. This was echoed by a paper from the Netherlands,[212] which also reported that GPs' handling of uncertainty or error tolerance influenced referral. Rosemann *et al.*[211] reported that GPs' experiences of referral were more positive if the GP's purpose was to reduce diagnostic uncertainty ($p < 0.001$). Abel and Thompson[20] found that GPs considered emotional or subjective concerns for the patient more relevant than subjective measures of risk. Espeland *et al.*,[217] similarly to the above studies, found that GP uncertainty influenced referral. Cornford *et al.*[218] reported that UK GPs varied in the extent to which they could accept the uncertainty about diagnosis. However, Forrest *et al.*,[219] in a US study, reported that anxiety as a result of to clinical uncertainty did not influence referral.

Peer opinion

An association between beliefs regarding peer opinion and referral was reported in three studies (*Table 32*).[209,212,220] All three showed a positive association between positive beliefs regarding peer opinion and referral outcomes (all were at lower risk of bias). The evidence for this association was, therefore, graded as stronger.

A UK study[220] found that intention to refer was significantly related to subjective norms (believing that a referral would be recommended by colleagues) and cognitive attitudes ($r = 0.917$ and 0.0896, $p < 0.001$). Bruyninckx *et al.*[209] found that GP referral was influenced by a perceived negative attitude towards the GP by specialists they had previously referred to. Van der Weijden *et al.*[212] also highlighted the influence of social norms on referral.

TABLE 32 Peer opinion

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where available	Response
Bruyninckx 2009[209]	Survey	Belgium	All specialties	163 GPs	NA
				55% female	
Green 2008[220]	Survey	UK	Eating disorders	88 GPs	33%
van der Weijden 2002[212]	Interviews	the Netherlands	Unexplained symptoms	21 GPs	NA

NA, not applicable.

Role perception

The influence of the GP having a specific perception of their own role (perception of role as gatekeeper, responsibility for the patient, or referring for patient reassurance) was highlighted in five studies (*Table 33*), all of which reported an association between role perception and referral outcomes. As only one study was graded at higher risk of bias,[20] the evidence for this association was graded as stronger.

One of three UK papers[201] reported that some GPs saw their role as preventing burden on other agencies and thus tended not to refer, whereas others perceived that their role was diagnostic and patients were best managed by others (and thus tended to refer). A second UK study[207] explored GP role perception and reported that low referrers saw hospitals as places to be avoided and that their role was to prevent admission. The other UK paper[177] found that low referrers to mental health services might take more responsibility for patients and have more interest in treating psychological problems. Young *et al.*[221] found that processes of referral were influenced considerably by the degree to which GPs had taken on broader chronic care models rather than a more traditional care approach. Abel and Thomspon[20] found that GPs perceived that referral and getting patients seen was part of their duty to do the best for the patient.

Views of a specialist service

The potential influence of a GP having specific views of a specialist service (as a result of increased familiarity with service or a better referral relationship, including communication with the specialist) was reported in 29 studies (*Table 34*).[108,161,164,176,177,181,186,200,201,214,222–239,292] Of these, 28 studies reported an association between a better GP view of a service and positive referral outcomes (one study reported no association).[214] Four studies were reported as having a higher risk of bias.[224,227,233] Despite this, the evidence for this association was graded as stronger.

TABLE 33 Role perception

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Abel 2011[20]	**Interviews**	**New Zealand**	**Colorectal cancer**	**15 GPs**	**NA**
				11 specialists	
Calnan 2007[207]	Interviews	UK	Immediate care	15 GPs, 10 male	NA
Knight 2003[177]	Interviews	UK	Mental health	Nine GPs	NA
				Eight male	
Nandy 2001[204]	Interviews	UK	Mental health	23 GPs	67%
Young 2010[221]	Interviews	Australia	All specialists	10 GPs	NA

NA, not applicable.
Bold text indicates study at higher risk of bias.

TABLE 34 Views of a specialist service

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Ahluwalia 2009[214]	**Survey**	**USA**	**Palliative care**	**145 GP**	**85%**
				58% female	
Allareddy 2007[232]	Focus groups	USA	Chiropractic	NR	NA
Barnett 2011[222]	Survey	USA	All specialties	386 GPs	63%
				64% male	
Beel 2008[226]	Interviews	Australia	Psychology	12 GPs	NA
				Eight male	
Berendsen 2007[237]	Interviews	the Netherlands	All specialists	21 GPs	NA
Chew-Graham 2008[229]	Interviews	UK	Mental health	GPs (no number)	NA
Clemence 2003[228]	Interviews	UK	Musculoskeletal conditions	22 GPs	NR
Dagneaux 2012[230]	Focus groups	Belgium	Geriatricians	NR	NA
Dale 2000[224]	**Survey**	**UK**	**Paediatric neurology**	**50 GPs**	**NR**
Delva 2011[161]	Survey	France	Oncology	436 GPs	NR
				75% male	
Forrest 2002[223]	Survey	USA	All specialties	141 GPs	NR
Gandhi 2000[108]	Survey	USA	Orthopaedics, cardiology and gastro	48 GPs	53–56%
				400 specialists	
Grace 2008[292]	Survey	Canada	Cardiology	510 GPs/specialists	36%
Harlan 2009[231]	Survey	USA	Paediatrics	10 paediatricians	NR
				12 GPs	
Jorgensen 2001[181]	Survey	Denmark	Physiotherapy	38,231 referrals	90%
				410 GPs	
Kinchen 2004[238]	Survey	USA	All specialists	1252 GPs	59.1%
Knight 2003[177]	Interviews	UK	Mental health	Nine GPs	NA
				Two practices	
				Eight male, one female	
Massey 2004[236]	Survey	UK	Physiotherapy	50 GPs	65%
McKenna 2005[225]	Survey	USA	All specialties	460 GPs	46%
				Mean age 48 years	
Mitchell 2012[186]	Survey/ interviews	Australia	Dietitian	90 surveys	20–22%
				52 interviews	
Morsi 2012[200]	Survey	USA	All specialties	10 GPs	NR
Pomeroy 2010[176]	Interviews/ survey	Australia	Dietitian	248 GPs (survey)	30%
				30 GPs interviewed: 14 male	
Ringard 2010[164]	Survey	Norway	All specialties	3483 GPs	48–50%
				Mean age 48 years	

TABLE 34 Views of a specialist service (*continued*)

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Samant 2007[234]	Survey	Canada	Radiotherapy	400 GPs	50%
Sigel 2004[201]	Interviews	UK	Psychological problems	10 GPs	40%
				Seven male	
				Age 38–60 years	
Taggarshe 2006[233]	**Focus group/ survey**	**UK**	**All specialists**	**NR**	**99%**
Thorsen 2012[239]	Focus groups	Norway	All specialists	31 GPs	NA
				17 female	
				Age 29–61 years	
Wakefield 2012[227]	**Survey**	**Canada**	**Cardiology**	**91 GPs**	**19.9%**
Xu 2002[235]	Audit	USA	All specialties	2572 GPs	NA
				79% male	

NA, not applicable, NR, not reported.
Bold text indicates studies at higher risk of bias.

Barnett *et al.*[222] reported that GPs initiated referrals to 66% of their professional network colleagues. Delva *et al.*[161] associated referral with whether or not the GP was used to collaborating with the oncologist. Morsi *et al.*[200] reported that 70% of GPs said that familiarity with the hospital influenced referral. Ringard[164] reported that referral was affected by having a formal arena for co-operation and exchange of information. Forrest *et al.*[223] reported that personal knowledge of the specialist was the most important reason for selecting a specific specialist. Jorgensen *et al.*[181] found that having frequent contact with a physiotherapist explained a small variation in referral rates (6.7% to 9.2%). Dale and Goodman[224] reported that reasons for referral were having prior knowledge of the service and having previously referred to the service. McKenna[225] found that GPs with greater understanding of the practice of the specialists were more likely to refer ($p = 0.003$). Sigel and Leiper[201] found that referral decisions were influenced by professional interactions with psychologists. Knight[177] found that previous experience with service influenced referral. Pomeroy and Cant[176] found that GP knowledge of local services affected referral. Beel *et al.*[226] found that GP dissatisfaction with professional communications from psychologists affected referral. Wakefield *et al.*[227] reported that previous experience with a facility affected referral. Clemence *et al.*[228] found that GPs' past experience of physiotherapy significantly affected referral. Chew-Graham *et al.*[229] found that lack of direct doctor-to-doctor communication was perceived to contribute to referral issues. Dagneaux *et al.*,[230] in areas with few geriatric services, found that doctors knew little of other professionals and reported suspicion and even conflicts. Harlan *et al.*[231] found that specialists and GPs acknowledge that significant barriers to optimal communication currently exist. Mitchell *et al.*[186] found that GPs' relationships with dieticians were believed to be the primary influencing factor on referral by 81% of dieticians. Allareddy *et al.*[232] reported that GPs expressed a lack of understanding of chiropractic care and did not have any relationship with practitioners. Gandhi *et al.*[108] found that 28% of GPs and 43% of specialists were dissatisfied with information received from the other group. Grace *et al.*[292] found that GP lack of familiarity with cardiology site locations negatively impacted referral ($p < 0.001$). Taggarshe *et al.*[233] found almost four out of five GPs made referrals specifically to a named surgeon and valued personal rapport with the consultant. Samant *et al.*[234] reported that physicians who referred patients for radiotherapy were more likely to have sought

advice from a radiation oncologist in the past. Xu *et al.*[235] found that the most significant determiner of perceived ability to refer was GP satisfaction in their communication with specialists. Massey *et al.*[236] found that those GPs not previously aware of a physiotherapy service would refer in the future. Berendsen *et al.*[237] found that 'developing personal relationships' and 'gaining mutual respect' dominated when the motivational factors for referral were considered. Kinchen *et al.*[238] found that previous experience with the specialist affected referral. Thorsen *et al.*[239] reported that GPs wished for improved dialogue with the hospital specialists. However, Ahluwalia *et al.*[214] found that having personal experience with palliative care was not statistically significantly associated with referral (OR 2.13, 95% CI 0.95 to 4.98).

General practitioner referral behaviour

A number of behaviour effects were reported following interventions which may be associated with changed referral pathways. Factors that were categorised as elements of GP referral behaviour associated with referral included the following subfactors.

Optimal timing of referral

One study was found that considered the potential significance of this aspect of the referral process.[240] This US paper reported that the enhanced use of optimal tests for kidney function by GPs could be associated with timely referral (*Table 35*).[240] The study was at low risk of bias and this evidence was graded as no evidence (evidence from only one study).

Optimal content of referral

The impact of optimal referral content was reported in eight studies (*Table 36*).[23,29,105,107,108,157,241,242] Of these, six showed an association between referral content and outcome[23,29,104,107,108,241] (two studies reported no association[156,242]). All of the studies were at lower risk of bias and the evidence for this association was graded as stronger.

TABLE 35 Optimal time of referral

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Greer 2011[240]	Survey	USA	Nephrology	178 GPs and specialists	NR

NR, not reported.

TABLE 36 Optimal content of referral

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Ferriter 2006[157]	BA	UK	Psychiatry	20 referrals	NR
Gandhi 2000[108]	Survey	NR	All specialties	430 referrals	NR
Harvey 2005[242]	Survey	UK	Psychiatry	107 GPs	94%
Jiwa 2004[23]	nRCT	UK	All specialties	26 GPs	100%
Jiwa 2009[241]	Audit	UK	Gastroenterology	207 referrals	NA
Jiwa 2012[105]	BA	Australia	All specialties	NR	NR
Kousgaard 2003[29]	Survey	Denmark	Oncology	199 GPs	88.3%
McGowan 2008[107]	RCT	Canada	All specialties	82 GPs	93.2%

BA, before-and-after; NA, not applicable; NR, not reported.

In the first of three papers by the same author, Jiwa *et al.*[241] reported that the cases that could be triaged from the letter were those where the letter contained more information (mean 66.38 vs. 49.86, mean difference 16, 95% CI 1.3 to 31.7; $p < 0.001$). The second paper[23] reported that feedback improves the content of GP referral letters and may also impact on the type of patients referred for investigation by specialists. The third[104] found that standardising and using electronic communications to refer facilitates the scheduling of specialist appointments. Kousgaard *et al.*[29] reported that better information provision before and after referral improved co-operation between the specialist department and the GP. McGowan *et al.*[107] found that providing timely information to clinical questions had a highly positive impact on decision-making and a high approval rating from participants. Gandhi *et al.*[108] echoed these other authors, highlighting that electronic referral can improve referral content and communication.

However, Harvey *et al.*,[242] in contrast, found no difference between higher- or lower-quality referral letters and referrals to psychiatric services. Ferriter *et al.*[156] suggested that the introduction of a single assessment process impaired clinical communication between GPs and psychiatrists.

Use of pre-referral testing

One paper[243] reported that in 72% of cases an alteration to the diagnostic investigations thought to be necessary by GPs was required when the patient was seen by a specialist (*Table 37*). The paper highlighted the importance of accurate referral information in order to select tests prior to consultation. The study was at lower risk of bias and this evidence was graded as no evidence.

Doctor–patient interaction

Outcomes relating to changing the doctor–patient interaction and the association between this and referral practice were described in a large body of work. Elements of the doctor–patient interaction included the following subfactors.

Optimal relationship

Having a positive doctor–patient relationship (optimal relationship) was reported to be positively associated with referral outcomes in 10 studies (*Table 38*).[177,192,204,211,237,244–248] As only two were considered to be at higher risk of bias, the evidence for this association was graded as stronger.

Baker *et al.*[192] found a greater emphasis on the fragility of the doctor–patient relationship in higher referrers, and reported the use of referral for radiography as a method of attempting to preserve this relationship. Nandy *et al.*[204] reported that poor rapport with a patient was a reason for referral. Carlsen *et al.*[244] found that the more the doctor and patient differ in attitude towards patient involvement, the more often the GP refers to specialist care ($p = 0.001$). Knight[177] also found that the quality of the doctor–patient relationship influenced referral decisions. Johnson *et al.*[245] similarly reported that communication and interpersonal issues affected referral. Forrest *et al.*[246] found that longer duration of the doctor–patient relationship was a positive predictor of referral completion. Rosemann *et al.*[211] found that experiences with the referral were more positive if the initiative for the referral came from the physician (beta = 0.365, $p < 0.001$). Ramchandiani *et al.*[247] reported that pooled lists were unpopular as they devalued the doctor–patient relationship. Berendsen *et al.*[237] reported that 81% of patients thought it was important that the GP gave them advice on which hospital or specialist to go to. Hyman *et al.*[248] found that physicians who spent more time on patient education were more likely to refer.

TABLE 37 Pre-referral testing

Study (first author and year)	Design	Country	Specialty/treatment	Sample size	Response
O'Byrne 2010[243]	Audit	UK	Respiratory consultants	50 referrals	NA

NA, not applicable.

TABLE 38 Optimal relationship

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Baker 2006[192]	Interviews	UK	Lumbar spine X-ray	29 GP	NA
				24 male	
Berendsen 2007[237]	Interviews	the Netherlands	All specialists	21 GPs	NA
Carlsen 2008[244]	**Survey**	**Norway**	**All specialties**	**41 GPs**	**46%**
				66% male	
Forrest 2007[246]	Survey	USA	All specialties	776 patients	NR
				133 GPs	
Hyman 2001[248]	Survey	Canada	Mammography	64 GPs	NA
				40% female, age range 29–71 (42.16) years	
Johnson 2011[245]	**Interviews**	**Australia**	**Oncology**	**40 GPs**	**NA**
				Mean age 47 (30–60) years	
Knight 2003[177]	Interviews	UK	Mental health	Nine GPs	NA
				Two practices	
				Eight male, one female	
Nandy 2001[204]	Interviews	UK	Mental health	23 GPs	67%
Ramchandiani 2002[247]	Survey	UK	Ophthalmology	50 GPs	64%
				776 specialists	
				85 patients, 55 female. Mean age 75.5 years	
Rosemann 2005[211]	Survey	Germany	All specialties	26 GPs	NR

NA, not applicable, NR, not reported.
Bold text indicates studies at higher risk of bias.

Shared decision-making

Shared decision-making between the GP and the patient was reported to be positively associated with referral outcome in four studies (*Table 39*).[177,190,204,244] As only two were at higher risk of bias,[190,244] the evidence for this association was graded as stronger.

Clarke *et al.*[190] found that the view that patients should be involved in referral decision-making was strongly supported by UK GPs. Another study from the UK[177] found that patient wishes and preferences influenced referral decisions. Carlsen *et al.*[244] reported a significant negative correlation between GP score and referral rate (–0.46, $p = 0.002$), indicating that GPs with a preference for patient involvement in Norway are less likely to refer. Nandy *et al.*, in a third UK study in this group,[204] reported that the patient desire to be referred was important.

Appropriate response to patient pressure

Response to patient pressure was reported to be associated with referral outcomes in six studies (*Table 40*).[207,210,249,250,251,252] All studies were at lower risk of bias and the evidence for this association was graded as stronger.

TABLE 39 Shared decision-making

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Carlsen 2008[244]	**Survey**	**Norway**	**All specialties**	**41 GPs**	**46%**
				66% male	
Clarke 2010[190]	**Survey**	**UK**	**Elective surgery**	**324 GPs**	**40%**
Knight 2003[177]	Interviews	UK	Mental health	Nine GPs	NA
				Two practices	
				Eight male, one female	
Nandy 2001[204]	Interviews	UK	Mental health	23 GPs	67%

NA, not applicable.
Bold text indicates studies at higher risk of bias.

TABLE 40 Response to patient pressure

Study (first author and year)	Design	Country	Specialty/treatment	Sample/treatment	Response
Calnan 2007[207]	Interviews	UK	Immediate care	15 GPs	NA
				10 male	
Little 2004[251]	Survey	UK	Depression	30 GPs	NA
				847 patients aged 16–80 years	
Morgan 2007[210]	Interviews	UK	Headache	20 GPs	50%
Rosen 2007[252]	Interviews, focus groups	UK	All referrals	GPs (no number)	NA
Stavrou 2009[249]	Interviews	UK	Mental health	14 GPs	47%
				Seven male. Mean age 39 years	
Vulto 2009[250]	Survey	the Netherlands	Palliative radiotherapy	489 GPs	45.5%
				65% male	

NA, not applicable.

Calnan *et al.*[207] found that low referrers described themselves as more able to resist pressure from family or carers. Stavrou *et al.*[249] found that no GP refused if a patient asked to be referred. The one non-UK study in this group[250] found that most GPs in the Netherlands reported that they reacted to the wishes of the patient regarding referral. Little *et al.*[251] found that doctor's perception of moderate or definite patient pressure was a predictor of referral behaviour: perceived slight patient pressure to be referred – 19% referred, 5% not referred (OR 8.99, 95% CI 4.91 to 16.46; $p = 0.994$); perceived moderate or definite pressure – 44% referred, 1% not referred (OR 125.3, 95% CI 51.3 to 306.5; $p = 0.005$). Morgan *et al.*[210] reported that GPs showed variations in an individual's willingness or 'resistance' to refer, reflecting differences in clinical confidence and views of patients' 'right' to referral. Rosen *et al.*[252] reported that most GPs make choices on the patient's behalf (with or without Choose and Book) unless the patient expresses a preference.

Patient factors

Although we found a large body of evidence regarding the potential influence of doctor–patient interaction on referral, we found no studies that reported patient knowledge outcomes and associated these with referral outcomes. Although patient knowledge outcomes were not reported, literature describing an association between patient attitude/belief elements and referral were found. Factors that were categorised as relating to patient attitude or beliefs included two subfactors: patient pressure and service use.

Patient pressure

The association between strong patient wishes (or the amount of patient pressure imposed on the GP) was reported as being associated with referral outcomes in 24 studies (*Table 41*),[165,176,177,179,200,202,208,210,217,223,224,237,249,251,253–261,270] of which five were at higher risk of bias.[165,202,208,224,255] Therefore, the evidence for this association was graded as stronger.

Blundell *et al.*[189] reported that the extent of patient involvement in the referral decision affected referral. Morsi *et al.*[200] found that patient preference was considered important in referral decisions by 62% of respondents. Forrest *et al.*[223] reported that patient request was the reason for 13.6% of referrals. Townsley *et al.*[165] found that a patient's desire to be referred influenced GPs' decision to refer. Stavrou *et al.*[249] found that referral was influenced by patient request and interest in referral; no GP refused if a patient asked to be referred. Dale and Goodsman[224] reported that 78% of GPs, in making a referral, were responding to parental concerns. Little *et al.*[251] found that patient pressure affected referral; where patient wish to be referred was slight, 16% were referred and 8% were not referred (OR 3.34, CI 1.88 to 5.93; $p = 0.796$), and where patient pressure was moderate or definite, 28% were referred and 5% were not referred (OR 8.51, CI 4.97 to 14.6; $p = 0.028$). Glozier *et al.*[254] found that greater personal control (patient) was associated with referral; assertive patients better able to influence and control their lives were more successful at obtaining an urgent referral. Anthony *et al.*[208] found that patient preference and resources (willingness to see a mental health specialist, and ability to pay) affected referral. Knight[177] found that patient wishes and preferences influenced referral decisions. Lakha *et al.*[179] reported patient preference for other treatments influenced referral decisions. Philichi and Yuwono[202] described that the second most frequently identified reason for referral to paediatric gastroenterology was parents wanting a second opinion (15%). Pomeroy and Cant[176] found that patient choice of treatment and willingness to attend affected referral. Musila *et al.*[255] found that ratings of referral appropriateness were strongly influenced by patients' referral preferences. Morgan *et al.*[210] found that readiness to refer in response to pressure was influenced by characteristics of the consultation, including frequent attendance, communication problems and time constraints. Davies *et al.*[256] found that patients also identified problems with communication, information and support about diagnosis when being referred for endoscopy. Edwards *et al.*[257] reported the importance of patient psychosocial factors in referral. Brien *et al.*[258] found that a match between the doctor's attitude and treatment preferences and patient views was important. Espeland *et al.*[217] found that patient wishes for radiography and the GP's response affected referral. Albertson *et al.*[270] found that continuity of care and familiarity with their GP are associated with patients initiating a referral discussion with their GP.

There were a few international studies where applicability in the UK was questionable: Bekkelund *et al.*[259] found less Norwegian patient satisfaction (52% dissatisfied) with self-referral than with doctor referral (42% dissatisfied). Lewis *et al.*[260] found that, in the USA, patients valued the freedom to choose their doctor and have unencumbered access to specialists. Gross *et al.*[261] reported that one-third of Israeli respondents preferred self-referral to a specialist. Forty per cent preferred their family physician to act as a gatekeeper, and 19% preferred the physician to co-ordinate care but to refer themselves to a specialist. Berendsen *et al.*[262] reported that 81% of patients in Norway thought that it was important that the GP gave them advice on which hospital or specialist to go to when they referred the patient.

TABLE 41 Patient pressure

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Albertson 2000[270]	Survey	USA	All specialists	12 GPs 822 patients	NR
Anthony 2010[208]	**Survey**	**USA**	**Depression**	**40 physicians; 15 general internists, 15 GPs, 10 nurse practitioners; 27 female, 13 male**	**NR**
Bekkelund 2001[259]	Survey	Norway	Neurology	105 patients	75%
Berendsen 2007[237]	Interviews	the Netherlands	All specialists	21 GPs	NA
Blundell 2010[253]	Interviews	UK	Surgical	22 GPs	96%
Brien 2008[258]	Interviews	UK	CAM	10 GPs	30%
Dale 2000[224]	**Survey**	**UK**	**Paediatric neurology**	**50 GPs**	**NR**
Davies 2007[256]	Audit	UK	Endoscopy	33 referrals	NA
Edwards 2002[257]	Focus group	UK	All specialists	86 GPs/nurses	51–90%
Espeland 2003[217]	Focus groups	Norway	Radiography	14 GPs	NA
Forrest 2002[223]	Cohort	USA	All specialists	141 GPs	NA
Glozier 2007[254]	Cohort	UK	Orthopaedics	188 referrals	NA
Gross 2000[261]	Survey	Israel	All specialists	1084 patients	81%
Knight 2003[177]	Interviews	UK	Mental health	Nine GPs Two practices	NA
Lakha 2011[179]	Survey	Canada	Pain clinic	47 GPs	32%
Lewis 2000[260]	Interviews	USA	All specialists	314 patients	NR
Little 2004[251]	Survey	UK	Depression	30 GPs	NA
Morgan 2007[210]	Interviews	UK	Headache	20 GPs	50%
Morsi 2012[200]	Survey	USA	All specialties	10 GPs	NR
Musila 2011[255]	**Referral audit**	**UK**	**Chronic knee pain**	**12 members including patients, GPs, orthopaedic surgeons and other health-care professionals**	**NA**
Philichi 2010[202]	**Survey**	**USA**	**Paediatric gastro**	**237 GPs**	**38%**
Pomeroy 2010[176]	Interviews/ survey	Australia	Dietitian	248 GPs (survey)	30%
Stavrou 2009[249]	Interviews	UK	Mental health	14 GPs	47%
Townsley 2003[165]	**Survey**	**Canada**	**Oncology**	**2089 GPs**	**24%**

CAM, complementary and alternative medicine; NA, not applicable, NR, not reported.
Bold text indicates studies at higher risk of bias.

Service use

Appropriate patient behaviour in terms of appropriate service use (number of patient visits to GP and previous referral) was reported as being associated with referral outcomes in eight studies, all at lower risk of bias (*Table 42*).[210,263–268,270] A further two lower-risk studies showed no association between these factors.[138,269] Overall, the strength of evidence was graded as weaker.

Shadd *et al.*[263] found that 92% of the variance in referral rates was attributable to the patient (rather than to the practice). Bertakis *et al.*[264] reported that after controlling for physical status, patient sex and age, more visits to the GP was associated with more specialist referrals. Dearman *et al.*[265] reported that patients referred to psychiatry had consulted their GP more frequently in the past year. Morgan *et al.*[210] found that GP readiness to refer for headache was influenced by frequent attendance. Ridsdale *et al.*[266] found that, for migraine patients, referred patients consulted more frequently than those not referred in the 3 months before referral ($p = 0.003$). Albertson *et al.*[157] found that patients were significantly more likely to have initiated the referral discussion when they had seen the GP previously; there was a trend for patient initiation of the referral discussion when the patient had known the GP for more than 1 year ($p = 0.08$) Cohen *et al.*[267] reported that a greater number of GP visits was related to a lower hazard ratio for referral and more days to referral. Harris *et al.*[268] found that previous referral was associated with the likelihood of subsequent referral.

TABLE 42 Service use

Study (first author and year)	Design	Country	Specialty/treatment	Sample size and details where reported	Response
Albertson 2000[270]	Survey	USA	All specialists	12 GPs	NR
				822 patients	
Bertakis 2001[264]	Survey	USA	All specialties	509 patients	NR
				26 GPs	
				79 specialists	
				38% male patients	
Cohen 2013[267]	Audit	USA	Otolaryngology	149,653 patients	NA
Dearman 2006[265]	Audit	UK	Psychiatry	1089 patients	NA
				Elderly	
Harris 2011[268]	Survey	Australia	Heart disease/hypertension	26 practices	NR
				Patient mean age 61.6 (19 to 90) years; 55% female	
Morgan 2007[210]	Interviews	UK	Headache	20 GPs	50%
Pfeiffer 2011[138]	Audit	USA	Mental health	49,957 patients	NA
				Mean age 55.7 years	
				93% male	
Ridsdale 2007[266]	Cohort	UK	Neurology	488 patients	NA
Shadd 2011[263]	Audit	Canada	All specialties	33,998 patients, 10 GPs	NA
Vinker 2007[269]	Survey	Israel	Ophthalmology, orthopaedics, ENT, dermatology	257 referrals	NR

NA, not applicable; NR, not reported.

However, in contrast to these papers reporting an association, Pfeiffer *et al.*[138] found that attendance at a primary care service for mental health was not a predictor of total number of specialist mental health clinic visits; and Vinker *et al.*[269] found that the length of time the patient was with the GP did not affect referral.

Non-intervention papers: predictors of changed practice

The second group of factors described in the non-intervention literature were elements which may moderate or mediate the outcomes described above, and act as predictors of whether of not an intervention will lead to long-term change in referral practice. Here, we examined evidence regarding the potential barriers or facilitators to the interventions changing practice at a local level and/or a health-care system level.

Moderating and mediating factors described in the literature related to the GP, the patient or the service in which the referral was taking place (*Table 43*). The complexity of the evidence here is further increased by many of the identified factors as operating in both directions, for example older age increases referral or older age decreases referral.

TABLE 43 Typology of moderating factors (barriers or facilitators)

Factor	Studies reporting association (first author and year)	Studies reporting no association (first author and year)	Strength
GP factors			
Years in practice	Longer = fewer: Calnan 2007,[207] **Fucito 2003,**[162] Townsley 2003[165] Longer = more: Elhayany 2000,[167] Franks 2000,[216] Ramanathan 2011,[188] Harvey 2005[242]	Albertson 2000,[270] Delva 2011,[161] **Johnson 2008,**[271] Jorgensen 2001,[181] Lakha 2011,[179] Vulto 2009,[250] **Wakefield 2012**[227]	iii
Age	Younger = more: Hugo 2000,[272] Jiwa 2008,[193] Pryor 2001,[215] Balduf 2008[274] Older = more: Bowling 2006,[273] Chan 2003,[275] Franks 2000,[216] **Fucito 2003,**[162] O'Neill 2005,[170] Swarzrauber 2002[171]	Albertson 2000,[270] Bolanos-Carmona 2002,[276] Delva 2011,[161] Elhayany 2000,[167] **Johnson 2008,**[271] Jorgensen 2001,[181] Lakha 2011,[179] Pomeroy 2010,[176] Ringard 2010,[164] Rushton 2002,[183] **Wakefield 2012,**[227] Wassenaar 2007[178]	iii
Ethnicity	**Ache 2011,**[277] Kinchen 2004,[238] Navaneethan 2010[278]	Lakha 2011[179]	iii
UK-qualified	Hugo 2000[272] (more), O'Neill 2005[170] (fewer)		iii
Sex	Females refer more: Bowling 2006,[273] Calnan 2007,[207] Chan 2003,[275] Cooper 2001,[279] Coyle 2011,[280] Feeney 2007,[282] Franks 2000,[216] Gruen 2002,[281] Hugo 2000,[272] Jorgensen 2001,[181] McKenna 2005[225] Males perceive barriers: Hyman 2001[248]	Albertson 2000,[270] Bolanos-Carmona 2002,[276] Delva 2011,[161] Elhayany 2000,[167] Forrest 2006,[283] **Johnson 2008,**[271] Lakha 2011,[179] Montgomery 2006,[180] Ringard 2010,[164] Rushton 2002,[183] **Wakefield 2012,**[227] Wassenaar 2007[178]	iii

continued

TABLE 43 Typology of moderating factors (barriers or facilitators) (*continued*)

Factor	Studies reporting association (first author and year)	Studies reporting no association (first author and year)	Strength
Previous experience/ familiarity with service	**Ahluwalia 2009,[214]** Allareddy 2007,[232] Balduf 2008,[274] Barnett 2011,[222] Beel 2008,[226] Berendsen 2007,[237] Brien 2008,[258] Chew-Graham 2008,[229] Clemence 2003,[228] Cornford 2004,[218] Dagneaux 2012,[230] **Dale 2000,[224]** Delva 2011,[161] Dodds 2004,[174] Forrest 2002,[223] Gandhi 2000,[108] Grace 2008,[292] Harlan 2009,[231] Holley 2010,[293] Jorgensen 2001,[181] Kier 2012,[294] Kinchen 2004,[238] Knight 2003,[177] **Massey 2004,[236]** McKenna 2005,[225] **Mitchell 2012,[186]** Morsi 2012,[200] Pomeroy 2010,[176] Ringard 2010,[164] Samant 2007,[234] Sigel 2004,[201] **Taggarshe 2006,[233]** Thorsen 2012,[239] **Wakefield 2012,[227]** Watson 2001,[195] Xu 2002[235]	Chan 2003,[275] Harris 2011[268]	i
Satisfaction with specialist service	Beel 2008,[226] Johnson 2011,[289] Knight 2003,[177] Nandy 2001,[204] Pryor 2001,[215] Ringard 2010,[164] Sigel 2004[201]	Guevara 2009[290]	i
Emotional response	Bowling 2000,[291] Espeland 2003,[217] Nandy 2001[204]		i
Ability to judge own referral	Baker 2006[192]		iii
Patient factors			
Ethnicity	Chen 2005,[286] Greer 2011,[240] Navaneethan 2010,[278] Chauhan 2012[284]	Johnson 2011[289]	ii
Age	Older referred more: Bertakis 2001,[264] Chan 2003,[275] Chauhan 2012,[284] Cohen 2013,[267] Forrest 2006,[283] Gruen 2002,[281] Harris 2011,[268] Jorgensen 2001,[181] Sullivan 2005,[285] Ramanathan 2011,[188] Ringard 2010,[164] Shadd 2011,[263] Van der Weijden 2002,[212] Zielinski 2008[166] Older referred less: Chen 2005,[286] McBride 2010,[287] Navaneethan 2010,[278] Robinson 2010,[288] Samant 2007,[234] **Todman 2011[295]** Children more: Chan 2003[275] Urgent referral younger: Vinker 2007[269]	Bruyninckx 2009,[209] Delva 2011,[161] Glozier 2007,[254] **Johnson 2008,[271]** Montgomery 2006,[180] Pomeroy 2010,[176] **Townsley 2003,[165]** Vulto 2009[250]	iii
Sex	Females referred more: Bertakis 2001,[264] Chauhan 2012,[284] Jorgensen 2001,[181] Sullivan 2005,[285] Shadd 2011,[263] Zielinski 2008[166] Males referred more: Bruyninckx 2009,[209] Chen 2005,[286] Cohen 2013,[267] Forrest 2006,[283] Gruen 2002,[281] McBride 2010,[287] Navaneethan 2010[278]	Vinker 2007[269]	iii
Level of education	Berendsen 2010,[262] Ringard 2010[164]	**Johnson 2008[271]**	iii
General patient-related social/ clinical factors	General: Bolanos-Carmona 2002,[276] Delva 2011,[161] Forrest 2006,[283] Harris 2011,[268] Johnson 2011,[245] Knight 2003,[177] Rushton 2002,[183] Shadd 2011,[263] Vulto 2009,[250] **Wakefield 2012[227]** Socioeconomic: Baker 2006,[192] Soomro 2000,[296] McBride 2010,[287] Mulvaney 2005,[297] Soerensen 2009,[298] Van der Weijden 2002[212]	Glozier 2007[254]	i

TABLE 43 Typology of moderating factors (barriers or facilitators) (*continued*)

Factor	Studies reporting association (first author and year)	Studies reporting no association (first author and year)	Strength
Clinical specialty/condition	**Anthony 2010,[208]** Bertakis 2001,[264] Chan 2003,[275] Chen 2005,[286] Harris 2011,[268] Johnson 2011,[289] Johnson 2011,[245] Knight 2003,[177] Little 2004,[251] Musila 2011,[255] Sullivan 2005,[285] Rushton 2002,[183] Shadd 2011[263]	Calnan 2007[207]	i
Comorbidity/ complexity of condition	**Anthony 2010,[208]** Bertakis 2001,[264] Cohen 2013,[267] Dearman 2006,[265] Forrest 2006,[283] Gruen 2002,[281] Harris 2011,[268] McBride 2010,[287] Navaneethan 2010,[278] Pomeroy 2010,[176] Ridsdale 2007[266] Rushton 2002,[183] Zielinski 2008[166]	Glozier 2007[254]	i
Responsiveness to treatment/ suitability/ likely benefit	**Anthony 2010,[208]** Baker 2006,[192] Blundell 2010,[189] Green 2008,[220] Johnson 2011,[245] Knight 2003,[177] Nandy 2001,[204] **Philichi 2010,[202]** Pomeroy 2010,[176] Samant 2007,[234] Sigel 2004,[201] Stavrou 2009,[249] **Steele 2012[203]**	**Ahluwalia 2009[214]**	i
Self-reported health	Harris 2011[268]		iii
Service and organisational factors			
Practice location	Greater distance to specialist: Jorgensen 2001,[181] Swarzrauber 2002,[171] Tzaribachev 2009[173] Local more: Franz 2010,[307] Hugo 2000,[272] Johnson 2011,[289] Jorgensen 2001,[181] Lakha 2011,[179] **Todman 2011,[295]** **Wakefield 2012[227]** More deprived location: Chan 2003,[275] Rosen 2007[252] Rural more: Shadd 2011,[263] Tucker 2003[198] Rural less: Jiwa 2008,[193] Ramanathan 2011,[188] **Townsley 2003,[165]** Zielinski 2008[166]	Delva 2011,[161] Gruen 2002,[281] Johnson 2011,[289] Love 2005,[302] Pryor 2001,[215] Rushton 2002[183]	iii
Size of practice	Large practice more: Chauhan 2012,[284] Forrest 2006,[283] Harris 2011,[268] Navaneethan 2010,[278] Trude 2003[199] Single GP more: O'Neill 2005[170]	Ashworth 2002,[303] **Johnson 2008,[271]** Johnson 2011,[245] Jorgensen 2001,[181] Montgomery 2006,[180] Rushton 2002,[183] Xu 2002[235]	iii
Other practice characteristics	Managed care higher: Forrest 2006,[283] Navaneethan 2010,[278] Sullivan 2005,[285] Walders 2003[300] Private higher: Hugo 2000,[272] Zielinski 2008[166] Admin resources higher: Boulware 2006,[304] Walders 2003[300] Assistants/nurses: Chung 2010[305] Financial arrangements in smaller practices only: Xu 2002[235] Care group/role in practice: Bolanos-Carmona 2002[276] Gatekeeping: Forest 2003	Ownership, managed care: Burns 2000,[301] Shadd 2011[263] Fundholding: Ashworth 2002,[303] Soomro 2000[296] Having onsite service: Greenaway 2006[306]	iii

continued

TABLE 43 Typology of moderating factors (barriers or facilitators) (*continued*)

Factor	Studies reporting association (first author and year)	Studies reporting no association (first author and year)	Strength
Physician burden/ time pressure	**Anthony 2010,[208]** Franz 2010,[307] Guevara 2009,[290] Kim 2009,[98] Knight 2003,[177] Kvaerner 2007,[168] Morgan 2007,[210] Nandy 2001,[204] **Philichi 2010,[202]** Trude 2003,[199] Van der Weijden 2002[212]	Albertson 2000,[270] Bolanos-Carmona 2002,[276] Hyman 2001[248]	i
Waiting time	Barnett 2011,[222] Bowling 2006,[273] Knight 2003,[177] Lakha 2011,[179] Ramchandiani 2002,[247] Ringard 2010,[164] Samant 2007,[234] Stavrou 2009,[249] **Steele 2012,[203] Taggarshe 2006,[233] Todman 2011[295]**		i
Availability of specialist	**Alexander 2008,[308] Anthony 2010,[208]** Franz 2010,[307] Guevara 2009,[290] Holley 2010,[293] Johnson 2011,[289] Johnson 2011,[245] Kvaerner 2007,[168], Morgan 2007,[210] Ramanathan 2011,[188] Trude 2003,[199] **Wakefield 2012[227]**	Forrest 2006,[283] Malcolm 2008[299]	i

Bold text indicates studies at higher risk of bias.

General practitioner factors

Moderating factors which were categorised as GP factors include the following subfactors.

The number of years a GP had been in practice was reported in 14 studies.[161,162,165,167,179,181,188,207,216,242,250,270,271,277] Of these, three studies reported that a GP who had been in practice longer referred less frequently.[162,165,207] Conversely, three studies reported that GPs who had been in practice longer referred more frequently.[167,188,216] One further study reported better-quality referral letters in those GP who had recently qualified.[242] An additional seven studies reported no association between number of years in practice and referral rate.[161,179,181,227,250,270,271] Overall, three of these studies[162,227,271] were at higher risk of bias and the evidence was graded as conflicting.

General practitioner age as a factor associated with referral outcomes was reported in 21 studies.[161,162,164,167,169,171,176,179,181,183,193,215,216,227,270–276] Again, the picture was very mixed, with four studies reporting higher rates of referral for younger GPs[193,215,272,274] and six studies reporting higher rates of referral for older GPs.[162,169,171,216,273,275] Thirteen studies reported no association.[161,164,167,176,178,179,181,183,227,270,271,272,276] Three of these studies[162,227,271] were at higher risk of bias and the evidence was graded as conflicting.

The ethnicity of the referring GP, or the country of their medical training, was reported by four studies.[179,238,277,278] Of these, three showed an association with referral outcomes.[238,277,278] The fourth study showed no association between ethnicity/country of training and referral.[179] One study was considered to be at higher risk of bias[277] and the evidence overall was graded as conflicting.

The sex of the GP was reported by 24 studies.[161,164,167,178–181,183,207,216,225,227,248,270–273,275,276,279–283] Eleven studies suggested that females refer more frequently,[181,207,216,225,272,273,275,279–282] with one further study[248] discussing perceived male barriers to referral. However, 12 studies reported no association between sex and referral outcomes.[161,164,167,178–180,183,227,270,271,276,283] Two were at higher risk of bias[227,271] and overall the evidence was graded as conflicting.

Previous experience or familiarity with the service referring to was reported as a factor associated with increased likelihood of referral outcomes in 38 studies.[108,161,164,174,176,177,181,186,195,200,201,214,218,222–239,258,268,274,275,292–294] Of these, 36 studies reported that previous experience of familiarity with a service was associated with an increase likelihood of referral.[108,161,164,174,176,177,181,186,195,200,201,214,218,222–239,258,274,292–294] Six of these studies[186,214,224,227,233,236] were considered at higher risk of bias. Only two studies reported no association[268,275] and so this evidence was graded as stronger.

Previous satisfaction with specialists, reported in eight studies (all at lower risk of bias), was shown to be associated with increased likelihood of referral in all but one.[164,177,201,204,215,226,289] The final study showed no association.[290] This evidence was, therefore, also graded as stronger.

The GP's emotional response to the patient was reported to be associated with referral in three studies of lower risk of bias.[204,217,291] A GP who had greater awareness of their own referral rate and who was able to judge their referral level as lower or higher was reported to be associated with likelihood of referral in one study.[192] As only one study reported this outcome, the evidence for this factor was graded as no evidence.

Patient factors

Moderating factors which were categorised as patient factors include the following subfactors.

Patient age as a factor associated with referral outcomes was reported in 30 studies. Twenty-five studies showed an association between age and referral rate, of which 14 studies reported higher rates of referral for older patients[164,166,181,188,212,263,264,267,268,275,281,283–285] and six studies reporting higher rates of referral for younger patients.[234,278,286–288,295] Chan *et al.*[275] also reported that children were referred more often than adults and Vinker *et al.*[269] reported more urgent referral for younger patients. A further eight studies reported no association between age and referral.[161,165,176,180,209,250,254,271] Three of these studies[165,271,295] were at higher risk of bias and the evidence was graded as conflicting.

An association between the ethnicity of a patient and referral was considered by five studies.[240,278,284,286,289] Of these, four showed an association with referral outcomes.[240,278,284,286] Three studies showed lower referral rates for non-white patients,[278,284,286] with one further study reporting improvement in timing of referrals for white patients compared with African Americans.[240] Johnson *et al.*[289] reported no association between ethnicity and referral. The studies were all considered to be at lower risk of bias and the evidence overall was graded as weaker.

The sex of the patient was reported to be associated with referral rate in 15 studies.[166,181,209,263,264,267,278,281,283–287] Six studies suggested that females were referred more frequently,[166,181,263,264,284,285] and seven further studies reported that males were referred more frequently.[209,267,278,281,283,286,287] One further study suggested no association between patient sex and referral.[269] All studies were at lower risk of bias and overall the evidence was graded as conflicting.

Patient level of education was reported in three studies.[164,262,271] Two studies reported an association between being more educated and being more likely to be referred.[164,262] and one study reported no association.[271] The third of these studies[271] was at higher risk of bias and the evidence was graded as conflicting.

A further 17 studies reported an association with referral outcomes (including one at higher risk of bias). General patient characteristics were reported to be associated with referral in 11 studies.[161,177,181,183,227,245,250,263,268,276,283] Socioeconomic characteristics of the patient were reported to be associated with referral decisions in a further six studies,[192,212,287,296–298] with lower deprivation leading to more referral. One further study reported no association between sociodemographic characteristics and urgent referral requests.[254] Overall, for this association, the evidence was graded as stronger.

Fourteen studies considered whether the clinical specialty being referred to, or the particular condition which the patient presented with, were associated with referral outcomes.[177,183,207,208,245,251,255,263,264,268,275,285,286,289] Thirteen studies reported that referral was moderated by clinical specialty[177,183,208,245,251,255,263,264,268,275,285,286,289] and only one did not.[207] In this group only one study was at higher risk of bias,[208] and the evidence was graded as stronger.

The presence of comorbidity or the complexity of the presenting condition was further reported as being associated with referral outcomes in 14 studies. Thirteen studies reported that referral was moderated by the complexity of the clinical presentation[166,176,183,208,264–268,278,281,283,287] and only one did not.[254] This evidence was graded as stronger.

Related to this, patient responsiveness to treatment, suitability for treatment or likely benefit of referral (perceived by the referring doctor) was reported in 14 studies[176,177,182,189,201–204,208,214,220,234,245,249] (four at higher risk of bias[202,203,208,214]), and suggested as being associated with referral outcomes in 13 studies.[176,177,182,189,201–204,208,220,234,245,249] Only one study (at higher risk of bias) showed no association.[214] The evidence for this association was graded as stronger.

Patient self-reported health was reported in one (lower risk of bias) study. Harris *et al.*[268] reported that patients with lower self-reported health were more likely to be referred. The evidence was, therefore, graded as no evidence.

Service factors

A number of elements were identified within the category of service factors, as follows.

The location of the GP practice (including the distance to service being referred to and whether urban or rural) was reported in 24 studies (three papers at higher risk of bias).[161,165,166,171,173,179,181,183,188,193,198,215,227,252,263,272,275,281,289,295,302,307] Of these, 18 studies[165,166,171,173,179,181,188,193,198,227,252,263,272,275,289,295,307] reported an association with referral outcomes but the directions of association were very mixed. Greater distance to the specialist was reported to be associated with a reduced likelihood of referral in three studies[171,173,181] and greater likelihood of referral to more local services was reported in a further seven studies.[179,181,227,272,289,295,307] A more deprived location was also associated with a reduced likelihood of referral.[252,275] Rural practices were associated with more referral in two studies[198,263] but less referral in a further four studies.[165,166,188,193] Five further studies reported no association between location of GP practice or distance to the specialist service and referral outcomes.[161,183,215,281,302] The strength of this evidence was graded as inconsistent.

An association between size of the GP practice and referral outcome was reported in six studies,[170,199,268,278,283,284] with no association reported by a further seven studies[180,181,183,235,245,271,303] (including one study at higher risk of bias[271]). Of those reporting association, five reported that larger practices were associated with higher referral rates[199,268,278,283,284] but one paper reported that single GP practices were associated with higher referral.[169] This evidence was graded as inconsistent.

A further 17 studies (at lower risk of bias) reported on other GP practice characteristics associated with referral outcomes, mostly relating to the fundholding or ownership of the practice. Thirteen studies reported an association[166,219,235,272,276,278,283,285,300,304–307] and four studies reported no association[263,296,301,303] for the following factors. Four studies reported that managed care practices were associated with higher rates of referral[278,283,285,300] but two studies reported no association with referral outcomes.[263,301] Two studies reported no association between fundholding practices and rates of referral.[296,303] The other factors associated with referral outcomes were private practice associated with higher referral,[166,272] greater administration resources associated with higher referral,[300,304] and practice nurses or assistants associated with higher referral.[305] In addition, financial arrangements in smaller practices were associated with referral outcomes (no direction reported);[235] links with a care group associated with referral outcomes (no direction reported);[276] and gatekeeping role associated with referral outcomes (no direction reported).[219] One final study reported no association with referral outcomes for having an on-site service to refer to.[306] Given this complexity, the association between additional practice characteristics and referral outcomes was graded as inconsistent.

General practitioners perceived to be under greater burden or time pressure were associated with referral outcomes in 11 studies[98,168,177,199,202,204,208,210,212,290,307] (including two studies at higher risk of bias[202,208]). Three studies reported no association.[248,270,276] This evidence was graded as stronger.

A perceived longer waiting time for the referral was associated with lower referral rates in 11 studies[164,177,179,203,222,233,234,247,249,273,295] (including three at higher risk of bias[203,233,295]). There were no studies reporting no association and so this evidence was graded as stronger.

Greater perceived availability of the specialist was associated with more frequent referral in 12 studies[168,188,199,208,210,227,290,245,289,293,307,308] (including three at higher risk of bias[208,227,308]). Only two studies reported no association between availability of the specialist and referral decisions.[283,299] This evidence was, therefore, graded as stronger.

Chapter 4 Summary of the evidence

What can be learned from the evidence on interventions to manage referral from primary to specialist care?

We firstly examined the overall evidence regarding referral management interventions by typology, and the overall rating of evidence of effectiveness for each group of studies which were described in the earlier sections (*Figure 2*).

In the first group (practitioner education interventions), the peer-review and feedback interventions were all shown to be effective to some degree in reducing referrals, although the appropriateness of that reduction was not always considered. Although there was a higher risk of bias for one study (Cooper[19]), the other three studies were considered to be at lower risk of bias.[21–23] The strength of evidence for effectiveness of this type of intervention was graded as stronger. The evidence indicated that this type of intervention with individual staff had the most potential to effect change. The evidence of effectiveness for the other approaches was more mixed, perhaps owing to the variation in the training provided in terms of

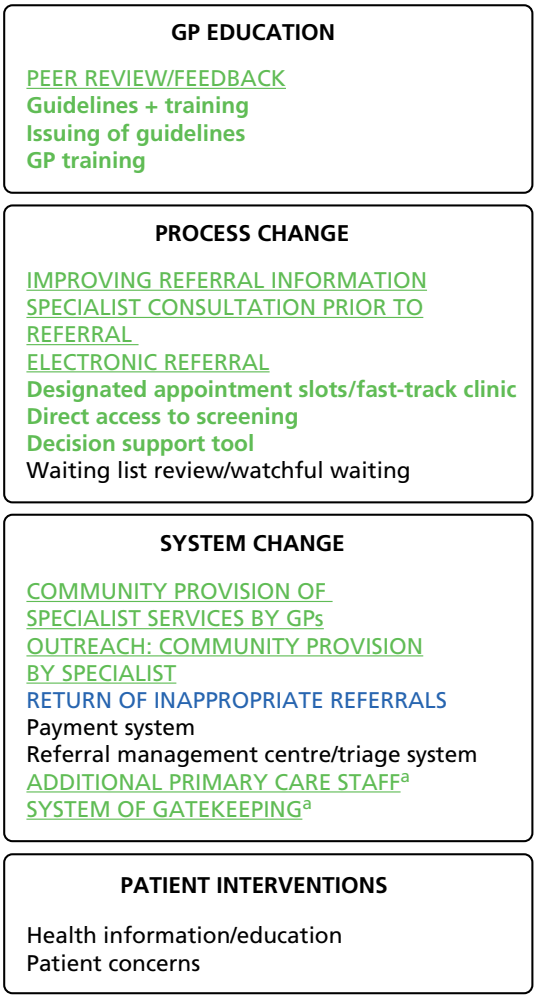


FIGURE 2 Summary of strength of evidence for referral management interventions. Green text, stronger evidence; blue text, weaker evidence; bold green text, conflicting evidence; standard black text, no evidence. a, Evidence in both directions (i.e. that these interventions may reduce referral but also that they may increase referral).

aim, duration and intensity. It was not possible overall to draw patterns from the data in terms of a particular type of training which may be more effective than another. Nor is it clear whether longer training programmes have greater impact than short-term or one-off interventions. However, although the evidence of effectiveness was not strong, there was some evidence that GP training could be effective in moderating referral outcomes in some contexts.

The review suggests that only in some limited situations does dissemination of guidelines have any positive effect on referral outcomes, and this is only seen over the short term. Dissemination of referral guidelines with further training, support or feedback seemed to have an inconsistent effect, with no clear patterns in terms of method of guideline development (e.g. local vs. national guidelines), or type of support provided or duration of study. There seemed to be some relationship between outcome and type of specialty; for example, low-back pain guidelines were ineffective,[66,67] but those interventions that focused on cardiology (two studies[56,63]), endoscopy (two studies[52,55]), and radiology (four studies[42,50,54,57]) were all effective, possibly suggesting that referral guidelines may be more effective in specialties where referral criteria are clearer and more consistent between patients.

With regard to the second group of interventions (process change), there were three types where evidence of effectiveness appeared to be stronger: firstly, improving the referral information provided to specialists; secondly, enabling a community practitioner to have contact with a specialist prior to the referral; and thirdly, the introduction of electronic referral. All interventions that were focused on improving referral information were shown to be effective in improving referral-related outcomes. It was particularly apparent (given the volume of studies) that pre-referral consultation via teledermatology (where images of the skin condition were sent) was effective in moderating referral and ensuring that those referrals which were made were appropriate. Although four of the five studies here were in the specialty of dermatology,[85,87,89,90] a cancer referral intervention using images was also effective,[96] suggesting that the use of sending images pre referral could be used more widely than in dermatology. All interventions that reported the introduction of consultation with a specialist seemed to be effective in improving referral-related outcomes. Similarly, in nearly all cases, electronic referral systems were shown to be effective in moderating referral-related outcomes. In the ineffective study in this group,[106] uptake and use of the new referral system was very low, which will have impacted on its effectiveness. These interventions seem to share a common purpose: all are designed to provide better-quality information to the specialist (either before or as part of a formal referral process).

From analysis of the studies with less clear evidence, it seemed that designated appointment slots and fast-track clinics may be effective in improving referral outcomes in some cases. The two interventions that were not effective were both focused on oncology referrals to meet the 2-week wait guidelines (although a third system for colorectal cancer referrals, in contrast, was shown to be effective). The evidence indicated that direct access to testing also might be effective in moderating referral outcomes in some cases. Of the three interventions here that did not show a clear effect, it was not possible to distinguish them from the effective interventions in terms of diagnostic test, specialty or length of the study. Decision support tools appeared to be somewhat effective in improving referral outcomes in around half of all the studies identified. We were unable to make distinctions between those studies that were effective and those that were not in terms of the content of the intervention or the specialty and/or location of the study (e.g. of three cardiology studies, one was effective[109] and the other two were not[114,116]). Only one of the waiting list interventions was shown to have a positive effect on referral outcomes.[118] The effectiveness of this study may be due to the fact that patients had been waiting considerably longer than in the other two studies (more than 2 years).

The overall picture for interventions which aim to moderate referral outcomes by wider change at the level of the health-care system is mixed. The evidence was strongest for two types of interventions: first, community practitioners being trained to carry out additional procedures, and, second, outreach clinics. Training GPs to provide a specific procedure in the community (such as LEEP training, ECG monitoring, minor surgery or spirometry) seemed to be effective, but the GPwSI programme was shown to be more variable.

Community provision by specialists in outreach clinics was generally shown to have positive effects on referral outcome measures. Two further types of intervention are highlighted in the figure as having stronger evidence of effect; however, these effects were not in a positive direction. The addition of extra nurses or counsellors in primary care did not show either clear positive effects on referral outcomes (with referral rates being no different from controls) or referral rates increasing (although it was not clear whether this increase was due to appropriate or inappropriate referrals). All four studies that evaluated the removal of gatekeeping or compared gatekeeping with an open-access system showed no (or very little) effect on referral outcome or an increase in community physician visits.[144–147] These studies highlight the potential impact on other elements of a system resulting from change to referral practice.

Other intervention types in this group had more mixed or limited evidence underpinning their use. Two interventions were identified which consisted of the return of inappropriate referrals; both showed a positive effect on referral outcomes by reducing further inappropriate referrals.[18,140] Further studies would be needed to understand whether or not this type of intervention could be effective more widely. The evidence for the effectiveness of referral management centres was very mixed, as the studies were divided in terms of whether or not they showed a positive effect on referral outcomes. In addition, of the studies showing a positive effect, two were considered to be at higher risk of bias, which may affect the reliability of their findings. The final category of interventions was patient-focused interventions. The available evidence here was limited, with the role of patients in the referral process seemingly under-researched. Of the three studies we identified, two had a significant effect on referral outcomes.

In terms of the outcomes that may result from these interventions, we found a wide range of measures of effectiveness used by studies. The outcomes divided into those earlier in the referral process, which could be considered to be at the level of the primary-care referrer, and those that were intended to have an impact at a whole-service or system-wide level. *Figure 3* provides a summary of the measures and the strength of evidence underpinning interventions having an effect on that outcome. As can be seen, the areas where there was stronger evidence that interventions may have an effect were mostly in the first group: improving the provision of referral information; reducing waiting time; and increasing practitioner and patient satisfaction. There was stronger evidence of an impact on waiting times; however, there was conflicting or weaker evidence of any interventions impacting at a system-wide level on referral rates, attendance rate, cost or appropriateness.

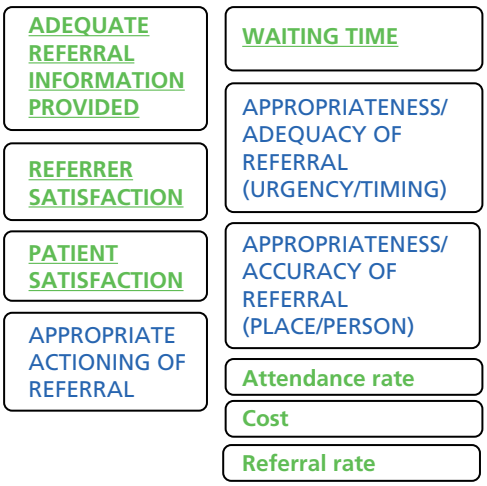


FIGURE 3 Reported outcomes and system impacts. Green text (uppercase and underlined), stronger evidence; blue text (uppercase), weaker evidence; bold green text (lowercase), conflicting evidence.

What are the pathways from interventions to outcomes?

We used all the elements identified and described in the preceding sections to compile an evidence-based logic model which illustrates the pathway from interventions to system-wide demand management outcomes (*Figure 4*). The model was constructed by listing the typology of interventions in the first column and the immediate/short-term effects that may result from interventions in the second column, and describing predictors of change (barriers or facilitators) in the third column. The final two columns detail the outcomes for demand management described in the literature at an individual level and then finally a system-level impact.

The model provides a detailed summary of the evidence found in the review relating to the effectiveness of interventions, the key outcomes resulting from interventions, potential obstacles to interventions effecting changed practice, and where there is stronger or weaker evidence of effect on demand management outcomes. The model highlights the complexity of the intervention change pathway, with the influence of individual-, context- and system-level factors acting as barriers and facilitators to any intervention achieving its intended impact in a particular health-care context.

The diagram also illustrates the broad scope of demand management interventions, and the range of outcomes that may result. In particular, it indicates the central role of intermediate factors in the pathway to broad system-wide impact. Currently, the majority of the intervention literature tends to use measures of system impact, whereas analysis of the pathway suggests that these intermediate elements are key important markers of change that should be evaluated in any assessment of intervention effectiveness. The model also highlights the challenges of identifying simple cause–effect relationships between individual interventions and a referral management impact.

How can evidence on interventions to manage referral from primary to specialist care be applied in a UK context, and what factors affect the applicability of international evidence in the UK?

We considered how the findings of the review were applicable and transferable to the UK NHS context. Of the 141 intervention papers we included, the largest group ($n = 83$) were from the UK, with an additional 19 from countries with similar systems (the Netherlands, Australia). There were a comparatively small number of North American papers ($n = 24$), with those countries' very different health-care systems suggesting that the findings of the review regarding the effectiveness of interventions are applicable to the UK without special consideration. The outcomes measured and reported by studies similarly have no particular issues of applicability.

Examination of the spread of country of origin across the intervention types indicates that there is representation of UK evidence for all but two interventions approaches (none of the four gatekeeping or four payment system papers was from the UK). The following papers originated in the UK: all of the papers regarding GP peer review, 9 of 17 papers regarding GP education, all 12 papers regarding guideline dissemination, 14 of 18 papers regarding guidelines plus training/feedback, four of six papers regarding fast-track interventions, all but one of nine papers on direct access interventions, 3 of 11 papers on specialist consultation, 4 of 10 papers on electronic referral, 4 of 10 papers on decision support, one of three papers on waiting lists, six of nine papers on GP provision of specialist services, 3 of 10 papers on specialists in the community, both papers on the return of referrals, two of three papers on additional staff, all but one of six papers on referral management centre, and two of three patient-focused papers. There is UK-based evidence, therefore, across individual, process and system typologies. The review finding that, with regard to individual-level interventions, the evidence was stronger only for peer-review and feedback approaches is significant given the dominance of UK papers evaluating training or guideline provision for individual practitioners.

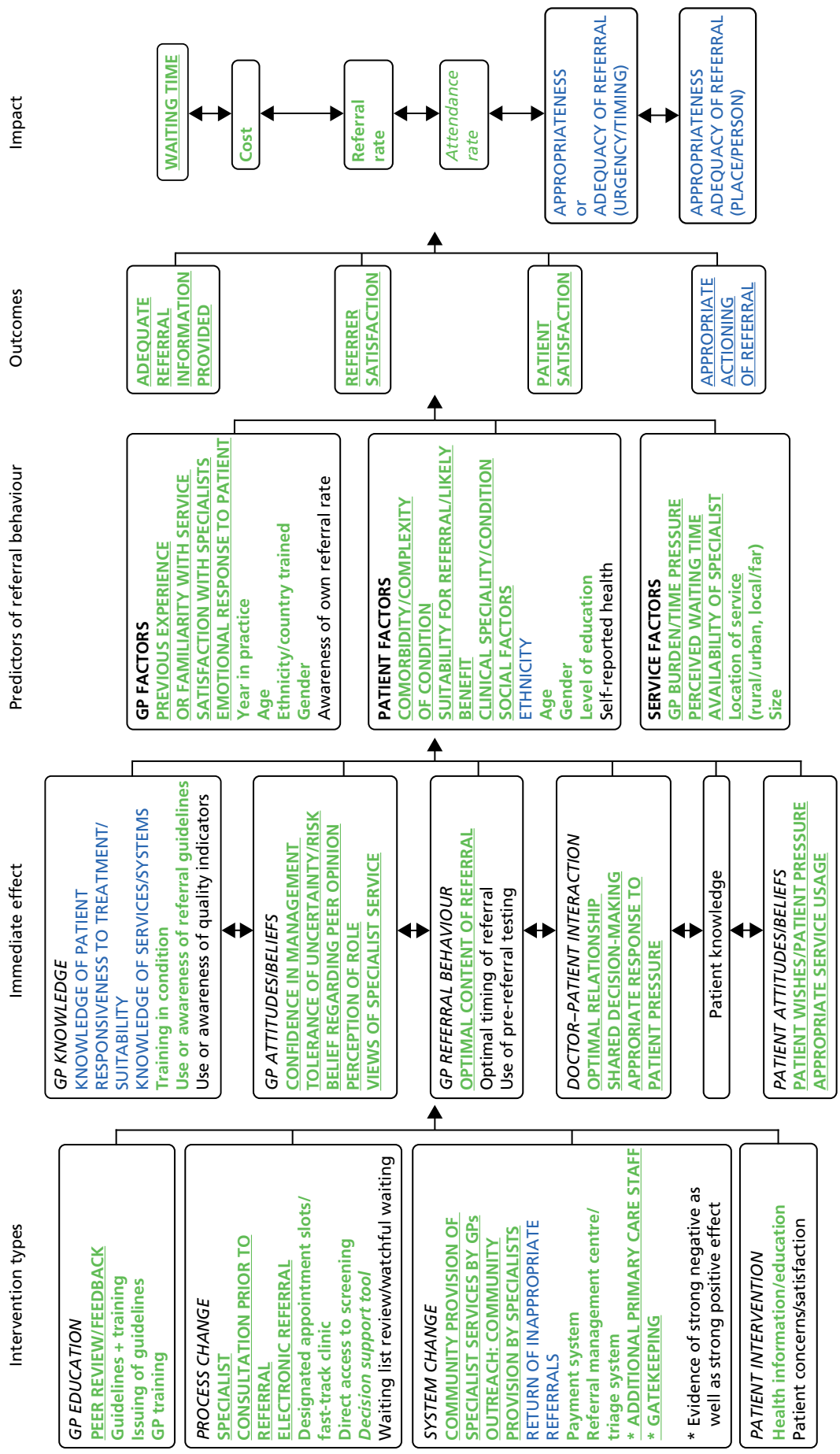


FIGURE 4 The pathway between interventions and intended impact. Note: the arrows indicate the direction of the pathway and do not imply causality. Green text (uppercase and underlined), stronger evidence; blue text (uppercase), weaker evidence; bold green text (lowercase), conflicting evidence; no evidence, standard black text.

The non-intervention papers were more spread in terms of country of origin, with around one-third (53 of 154) originating from the UK and almost the same number ($n = 52$) from North America. Examination of the spread of UK studies across the factors, however, showed that there was representation in all but two categories (the one awareness of quality study was from the USA, and the one optimal timing of referral study was from the USA). This underpinning of the evidence by UK data suggests that the findings regarding these influential factors in the pathway from intervention to outcomes is applicable in the UK context.

In order to further assess how the findings of the review may be applied in the UK context, and the extent to which the diagrammatic representation of the evidence resonated with the real-life experiences of practitioners and commissioners of services, we carried out a phase of evaluation and feedback. We sought the views of key stakeholders from primary care, specialist services and NHS commissioners via a series of presentations and one-to-one meetings. In total, 44 individuals contributed to the validation stage of the work, including 15 GPs, five commissioners, seven members of the public and 17 hospital specialists. The specialties represented included infectious diseases ($n = 1$), gynaecology ($n = 1$), neurology ($n = 5$), palliative care ($n = 2$), haematology ($n = 1$), cardiology ($n = 3$), speech and language therapy ($n = 1$), orthopaedics ($n = 1$), oncology ($n = 1$) and respiratory medicine ($n = 1$).

Overall, most participants reported that they had clearly understood the logic model, with 38 respondents giving a positive first response (100% of GPs, 100% of commissioners, 76% of specialists and 71% of public respondents). Of those who felt they did not understand it ($n = 6$), four specialists described the model as too complex and two members of the public found it confusing.

All GPs reported that the model was a good fit with their experience of the way in which referrals are managed. In particular, they discussed how successfully the model was able to portray the 'chaos' of general practice. GPs also described how the model had highlighted the role of both the GPs' and the patients' attitudes and beliefs, the doctor–patient interaction, and especially the emotional response to the patient, which resonated very much with their experiences as a doctor. Most specialists also reported that the model was a good fit with their experience of the way referrals are managed. However, three specialists criticised the model as being a model of the literature and that this was not the same as the referral process. These participants wished to highlight that referral is often a non-linear process and also that it may be necessary to have a different model for different conditions.

The commissioners reported that the model would be useful when analysing the demand management pathway when commissioning, and for comparing what was being commissioned with what was evidence-based. GPs and commissioners also highlighted that it would be useful for people who educate GPs, and for GPs undergoing training. One GP also was positive regarding the potential of the model as a teaching aid for undergraduates. Patient and public representatives described it as useful for directing research in poorly evidenced areas, and in discussion with GP practices. However, three patient and public representatives reported that they could not see any obvious use for the model.

Many respondents mentioned factors which they thought were missing from the model but which were in fact embedded within the terms used. Although the model was able to convey a vast amount of information, some grouping and categorising had inevitably masked individual subelements. There were a small number of factors mentioned which were not included in the reviewed literature (and, therefore, not represented in the model). One specialist noted that the presence of a locum GP might affect the likelihood of referral. A patient and public representative mentioned that the influence of carers (both family members and nursing home staff) might be important in determining whether or not an elderly person was referred. A number of GPs in the focus group discussed the impact of disease burden, although it was ultimately agreed that this would fall outside the model remit, probably sitting to the left of the intervention column. A number of specialists commented on the amount of information that was sent back to the GPs after a referral, echoing comments about the referral process not always being linear. Several respondents suggested that there should be 'feedback loops' included in the model.

Overall, as a result of this feedback process, several changes were made to the draft model including categorising 'conflicting evidence' and 'no evidence' separately, ensuring consistency of terms throughout the model, and alterations to the arrows between the boxes.

In addition, during this validation and evaluation phase of the work, we sought to compare our findings with other international systematic reviews of evidence. A separate analysis of systematic review papers was undertaken to compare our review findings with previous reviews of the area to further explore generalisability of the current findings. Further detail on the individual systematic review papers is provided in *Appendix 6*.

The review of reviews focused on systematic and narrative reviews of interventions to manage referral from primary to specialist care. In total, 30 unique reviews met the inclusion criteria and were included in this review of reviews. The review papers identified both factors that influence the referral process and interventions to manage demand. Seventeen of the reviews were judged to be at lower risk of bias, with the remaining 13 at higher risk of bias, largely because of the inadequate description of the search methodologies adopted, or the primary studies included in the review.

Although the number of reviews identified and included suggests a large body of evidence of interventions to manage referrals from primary to secondary care, there was considerable duplication among the reviews identified. A number of the identified reviews drew their findings solely from previous reviews, resulting in the duplication of primary studies, and therefore of findings, across the reviews. Another consequence of this was that a relatively small number of unique primary studies included in the reviews were of relevance here.

Overall, we found that many of the other reviews had been unable to reach firm conclusions about what interventions were effective or not effective. Many reviews were unable to draw robust conclusions because of the inconsistent findings between the primary studies considered. Therefore, their findings echoed our review in concluding that interventions with similar approaches could result in different outcomes in different contexts. Other reviews also concurred with our finding that the passive dissemination of guidelines is unlikely to change referral behaviour (although there was some evidence to suggest that guidelines with education/structured checklists, and feedback and training for GPs, may improve the pre-referral management of patients). Other reviews we examined also highlighted that there was very little review-level evidence on the effectiveness of referral management centres or evidence of interventions aimed at patients and public around changing behaviour, self-care or self-appraisal, together with a lack of evidence around cost-effectiveness of interventions and their sustainability. Some of the other studies highlighted the risk of stimulating demand with interventions that provide an alternative way of accessing a service, for example outreach or attaching specialists to primary care. Many of the other reviews similar to the current work highlighted the need for a whole-systems approach to referral management.

Limitations of the study

Our systematic review and logic model synthesis has added to the existing literature by moving beyond the assumptions about outcomes, to detail fully the pathway between interventions and system-wide impact. The review was also inclusive in terms of study design and considered a large volume of literature. The potential limitations of the work, however, relate firstly to our population inclusion criteria, with the review focusing on demand management within community medical services. We recognise that other services such as community dental practices make referral to specialist services, and therefore our exclusion of studies examining these services may have omitted potentially useful data.

A key potential area of debate concerns our adopted system of quality appraisal and assessment of strength of evidence. There are many available systems for critical appraisal of studies. Our selection of a tool was based on the requirement that it would be applicable to multiple study designs; also, given the substantial volume of literature that we included, that the tool would be assess the range of potential sources of bias while not being overly long to complete. Although there were many quality appraisal systems to select from, we found considerably fewer options for examining overall strength of evidence. Although a simple tally of numbers of studies has been used by some authors, the system we selected, while we recognise its limitations, was able to consider not only quantity but also consistency in evidence and quality of evidence.

Our grouping of interventions may also be a source of limitation in interpretation of the findings. Although the typology was able to distinguish different forms of content successfully, it should be recognised that there may be overlap between categories and, although we identified the core constituents, some interventions may have included several elements.

In terms of evaluation of outcomes, at times it was difficult to establish which outcome measures should be considered as positive, for example where interventions encourage referrals irrespective of their appropriateness, or where quicker referral processes are created and are, therefore, positive; however, this has a cost implication for the system. The concept of appropriateness as an outcome was particularly challenging to interpret as views may differ between community and specialist practitioners, and also, for example, patient satisfaction and/or mental well-being may be increased by a referral; however, the referral may be considered unnecessary.

Although the evidence identified here is international in nature and some of it originates from countries with different health-care systems and processes from the UK, as we have outlined in other sections, the vast majority of studies have relevance in the UK within a NHS setting. It is likely that differences between specialties, UK demographic variation and the impact of individual patients and practitioners will have a stronger impact on the effectiveness of the interventions in a given location than will their country of origin.

We chose to use logic model methods to synthesise the review findings as they have been suggested as useful explanatory tools. The process of evaluation that we undertook following completion of the synthesis indicated that the method was able to provide a detailed illustration of multiple elements of interventions and outcomes which was viewed positively by the majority of stakeholders. The model was able to summarise a complex set of data in a single diagram; however, for some this complexity was viewed as being confusing and overcomplicated. Some practitioners pointed out that this 'messiness' represented the reality of endeavouring to manage referral demand, and, although the method may have limitations, it perhaps serves to confirm the challenges inherent in designing and implementing effective complex interventions.

Implications for health care

Our systematic review of the literature and logic model synthesis suggests that no one level of intervention (GP training, process change, system change or patient intervention) stands out as being much more successful than any other in producing successful referral outcomes. However, some groups of interventions may have greater potential for development, given the existing evidence that they can be effective in specific contexts.

The findings suggest that, although individual-level interventions may be popular, the stronger evidence relates to only the effectiveness of GP peer-review and feedback interventions, with evidence underpinning the implementation of formal training and referral guidelines less clear. Providing training (or reinforcement) of guidelines may aid their use.

Process change interventions appear to be most effective when the changes result in the specialist being provided with more or better-quality information about the patient – whether that is provided electronically (electronic referral) as part of the referral process, or via specialist consultation prior to the formal referral being made. The evidence is less strong for the effectiveness of process interventions which do not result in earlier interaction with a specialist (designated appointment slots/fast-track clinics, direct access to screening, and decision support tools).

With regard to system changes, the community provision of specialist services by GPs (having been previously trained by specialists), outreach or community provision by specialists, and the return of inappropriate referrals, all engage the specialist and show the stronger evidence of effect on referral outcomes. However, the evidence suggests that the addition of other primary care staff (e.g. nurses, counsellors) into a GP practice can have a negative effect on referral outcomes including referral rate and appropriateness of referral (although the amount of evidence here was limited).

The evidence for gatekeeping systems overall was very inconsistent and appeared to suggest that adding or removing a gatekeeping system had no positive impact on referral (although there were possibly small negative effects). The evidence here was weaker and originated from countries with different health-care systems from that of the UK.

Despite additional targeted searches, we found a significant lack of an evidence base to support referral management centres or other large triage systems. We were also surprised to find an almost complete lack of patient-focused interventions. This is particularly relevant given the evidence highlighting the impact that the doctor–patient relationship, and the role of patient factors, may have on the referral decision.

A key contribution of this review has been the highlighting of elements that act as mediators and moderators to intervention outcomes. We found a considerable volume of literature which endeavoured to link particular practitioner demographics to referral patterns; however, no clear associations were apparent. Instead, the factors that appeared to be important related to practitioner views and knowledge of the service which was being referred to (previous experience or familiarity with service, and satisfaction with service), and their emotional response to the patient. The importance of understanding that the GP is an individual and that each referral decision is unique was voiced strongly in feedback on the review findings during our validation work. This is further underpinned by evidence regarding the influence of individual patient factors relating to clinical condition (clinical specialty/condition, comorbidity/complexity of condition, and suitability for referral/likely benefit from referral). These factors were important in predicting whether or not referrals would be made.

In terms of service factors, the particular characteristics of the GP practice (location, size and ownership) seemed less important than factors associated with the service referred to (waiting time and availability of specialist). The burden imposed on GPs' time by the service they were working in was also important in influencing the referral process. These local factors will influence the success and applicability of any interventions.

In interpreting the findings of this review it is important to recognise that a number of the interventions we have identified are condition specific (such as sending photographs with dermatology referrals) and that the same intervention may not be transferable across different conditions or diseases. What may be less clear but equally important is that the same also applies to the moderating and mediating factors. For example, the effect of one patient demographic factor such as age may be a strong predictor of referral in certain conditions.

This review has highlighted the value of overall consideration of the entire referral system rather than examined individual components. To tackle demand management of primary care services, the focus cannot be on primary care alone – a whole-systems approach is needed as the introduction of interventions in primary care is often just the starting point of the referral process. Patton[309] has

emphasised a 'systems perspective as becoming increasingly important in dealing with and understanding real-world complexities' (p. 120). With the introduction of interventions in primary care there are likely to be implications for secondary care. Furthermore, in a climate of 'payment by results', any intervention that reduces secondary care activity means a loss of income to secondary care and the implications of this would require consideration. When considering potential interventions to influence referral management, too little regard may be given to the whole referral system, including ensuring that people are referred to the most appropriate destination, that referrals are timely, that all necessary pre-referral tests have been done and that referral letters include all pertinent information. Authors such as Anderson[310] argue that health-care organisations should be seen as 'unpredictable and disorderly', seen as 'complex, adaptive systems' rather than 'a well-oiled machine'. Complexity theory suggests that it is the interaction and interdependency among elements as well as the unity as a whole that needs to be studied, with the key to understanding a health-care system being 'patterns of relationships and interactions'.[311]

In addition, many of the most complex interventions require culture change as well as a change in individual attitudes. However, often the interventions and strategies have been implemented without due regard to the challenges of changing culture or engaging individuals. This review and model detailing the pathway of change should help to emphasise the role of individuals in the change process.

Recommendations for research

1. More research is needed to develop and evaluate interventions that acknowledge the role of the patient in the referral decision. We found a lack of interventions aimed at providing health information or education to patients or to moderate their concerns or satisfaction regarding a referral. This is an important aspect to tackle, as our model showed that both patient pressure and their relationship with their GP can affect whether or not a referral occurs.
2. Research is also required to better understand the relationship between GP knowledge and GP attitudes and beliefs in terms of how an intervention is framed and how responsive practitioners are to change. The review findings indicate that attitudes and beliefs of the patient and the GP, as well as the doctor–patient interaction, are potentially important mechanisms of change which interventions should seek to impact and should measure in outcome evaluations. It is suggested that interventions focusing on these have a greater potential for impacting on referral demand outcomes. This suggests that interventions which act only to change knowledge may not be as effective as those acting on attitudes and beliefs. This is particularly important for future intervention study design as knowledge is relatively easy to measure and therefore more likely to be included, whereas change in attitudes and beliefs may be more challenging to evaluate.
3. This work highlights that intermediate outcomes such as the content of the referral provided to the specialist are important in the referral pathway. It is only by recognising and evaluating these individual outcomes that the intervention change pathway can be understood. It is recommended that researchers include measures of these intermediate outcomes in their evaluation of intervention effectiveness in order to determine where blocks or facilitators to system-wide impact may be occurring.

Acknowledgements

We would like to acknowledge the members of our steering group for their invaluable contribution to this research: Dr Martin McShane, NHS England; Professor Danuta Kasprzyk (Department of Global Health, University of Washington); Professor Helena Britt (Family Medicine Research Centre, University of Sydney); Ellen Nolte (RAND Corporation Europe/international); Jon Karnon (School of Population Health and Clinical Practice, University of Adelaide); Christine Allmark [patient and public involvement (PPI)]; and Brian Hodges (PPI). Thanks also to all of those who contributed to the validation stage of the work.

Contributions of authors

Dr Lindsay Blank (Research Fellow) was the principal investigator and study manager for this project. She acted as lead reviewer and drafted the final report.

Dr Susan Baxter (Research Fellow) led the logic model development aspect of the work, contributed as a reviewer to all aspects and revised the report following reviewer feedback.

Helen Buckley Woods (Information Specialist) took the lead in the searching aspects of the work.

Professor Elizabeth Goyder (Professor of Public Health) provided oversight and guidance to the project.

Dr Andrew Lee (Senior Clinical University Teacher in Public Health/GP) provided a strategic overview to the project from a NHS perspective and provided expertise in translation of the findings to the NHS context.

Professor Nick Payne (Honorary Professor of Public Health) provided oversight and guidance to the project in terms of review methods and the NHS context.

Melanie Rimmer (Research Assistant) contributed to data collecting during the validation stage and proofreading the report.

All authors have read and approved the final report.

Publications

Baxter SK, Blank L, Woods HB, Payne N, Rimmer M, Goyder E. Using logic model methods in systematic review synthesis: describing complex pathways in referral management interventions. *BMC Med Res Methodol* 2014;**14**:62.

Blank L, Baxter S, Woods BH, Goyder E, Lee A, Payne N. Referral interventions from primary to specialist care: a systematic review of international evidence. *Br J Gen Pract* 2014;**64**:e765–74.

References

1. Akbari A, Mayhew A, Al-Alawi MA, Grimshaw J, Winkens R, Glidewell E, *et al.* Interventions to improve outpatient referrals from primary care to secondary care. *Cochrane Database Syst Rev* 2008;**4**:CD005471. http://dx.doi.org/10.1002/14651858.CD005471.pub2
2. Faulkner A, Mills N, Bainton D, Baxter K, Kinnersley P, Peters TJ, *et al.* A systematic review of the effect of primary care-based service innovations on quality and patterns of referral to specialist secondary care. *Br J Gen Pract* 2003;**53**:878–84.
3. Dunst CJ, Gorman E. Practices for increasing referrals from primary care physicians. *Cornerstones* 2006;**2**:1–10.
4. Grimshaw JM, Winkens RA, Shirran L, Cunningham C, Mayhew A, Thomas R, *et al.* Interventions to improve outpatient referrals from primary care to secondary care. *Cochrane Database Syst Rev* 2005;**3**:CD005471.
5. Imison C, Naylor C. *Referral Management – Lessons for Success*. The King's Fund; 2010. URL: www.kingsfund.org.uk/sites/files/kf/Referral-management-lessons-for-success-Candace-Imison-Chris-Naylor-Kings-Fund-August2010.pdf (accessed 24 January 2014).
6. Rees K, Bennett P, West R, Davey Smith G, Ebrahim S. Psychological interventions for coronary heart disease. *Cochrane Database Syst Rev* 2004;**2**:CD002902. http://dx.doi.org/10.1002/14651858.CD002902.pub2
7. Weiss C. Nothing as Practical as Good Theory: Exploring Theory-Based Evaluation for Comprehensive Community Initiatives for Children and Families. In Connell J, Kubisch A, Schorr L, Weiss C, editors. *New Approaches to Evaluating Community Initiatives Vol 1: Concepts, Methods and Contexts*. Washington, DC: Aspen Institute; 1995. pp. 65–92.
8. Weiss C. Theory-based evaluation: past, present and future. *New Dir Eval* 2007;**76**:68–81.
9. Dyson A, Todd L. Dealing with complexity: theory of change evaluation and the full service extended schools initiative. *Int J Res Method Educ* 2010;**33**:119–34. http://dx.doi.org/10.1080/1743727X.2010.484606
10. Blamey A, Mackenzie M. Theories of change and realistic evaluation: peas in a pod or apples and oranges. *Evaluation* 2007;**13**:439–55. http://dx.doi.org/10.1177/1356389007082129
11. Connell J, Kubisch A. Applying a Theory of Change Approach to the Evaluation of Comprehensive Community Initiatives: Progress, Prospects and Problems. In Fullbright-Anderson K, Kubisch A, Connell J, editors. *New Approaches to Evaluating Community Initiatives, Vol 2: Theory, Measurement and Analysis*. Queenstown: The Aspen Institute; 1998. pp. 15–44.
12. Evidence for Policy and Practice Information and Coordination (EPPI) Centre. *EPPI-Centre Methods for Conducting Systematic Reviews*. 2010. URL: http://eppi.ioe.ac.uk/cms/LinkClick.aspx?fileticket=hQBu8y4uVwI%3D&tabid=88 (accessed 14 January 2014).
13. Grant MJ, Brettle A, Long, AF. *Developing a Review Question: A Spiral Approach to Literature Searching. Poster presentation*. 3rd Symposium on Systematic Reviews: Beyond the Basics, Oxford, 3–5 July 2000.
14. Baxter S, Killoran A, Kelly M, Goyder E. Synthesising diverse evidence: the use of primary qualitative data analysis methods and logic models in public health reviews. *Public Health* 2010;**124**:99–106. http://dx.doi.org/10.1016/j.puhe.2010.01.002

15. Allmark P, Baxter S, Goyder E, Guillaume L. Crofton-Martin G. Assessing the health benefits of advice services: using research evidence and logic model methods to explore complex pathways. *Health Soc Care Comm* 2013;**21**:59–68. http://dx.doi.org/10.1111/j.1365-2524.2012.01087.x

16. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Med Res Methodol* 2008;**8**:45. http://dx.doi.org/10.1186/1471-2288-8-45

17. Hoogendoorn WE, van Poppel MNM, Bongers PM, Koes BW, Bouter LM. Physical load during work and leisure time as risk factors for back pain. *Scand J Work Environ Health* 1999;**25**:387–403. http://dx.doi.org/10.5271/sjweh.451

18. Wylie KR, Davies-South D. Returning a referral for erectile dysfunction to the referrer by two different routes. *BJU Int* 2001;**87**:846–8. http://dx.doi.org/10.1046/j.1464-410x.2001.02188.x

19. Cooper R. How peer review reduced GP referrals by 25% in two months. *Pulse* 2012;**72**:31.

20. Abel G, Thompson L. General practitioners, specialists and surveillance guidelines: Interpreting the socio-clinical context of decision-making. *Health Risk Soc* 2011;**13**:547–59. http://dx.doi.org/10.1080/13698575.2011.615826

21. Evans E. The Torfaen referral evaluation project. *Qual Prim Care* 2009;**17**:423–9.

22. Evans E, Aiking H, Edwards A. Reducing variation in general practitioner referral rates through clinical engagement and peer review of referrals: a service improvement project. *Qual Prim Care* 2011;**19**:263–72.

23. Jiwa M, Walters S, Mathers N. Referral letters to colorectal surgeons: the impact of peer-mediated feedback. *Br J Gen Pract* 2004;**54**:123–6.

24. Hilty DM, Yellowlees PM, Nesbitt TS. Evolution of telepsychiatry to rural sites: changes over time in types of referral and in primary care providers' knowledge, skills and satisfaction. *Gen Hosp Psychiatry* 2006;**28**:367–73. http://dx.doi.org/10.1016/j.genhosppsych.2006.05.009

25. Lam TP, Chow RWM, Lam KF, Lennox IM, Chan FHW, Tsoi SLT. Evaluation of the learning outcomes of a year-long postgraduate training course in community geriatrics for primary care doctors. *Arch Gerontol Geriatr* 2011;**52**:350–6. http://dx.doi.org/10.1016/j.archger.2010.05.019

26. Rowlands G, Sims J, Kerry S, Keene D, Hilton S. Within-practice educational meetings and GP referrals to secondary care: an aid to reflection and review of clinical practice. *Educ* 2003;**14**:449–62.

27. Ramsay CR, Eccles M, Grimshaw JM, Steen N. Assessing the long-term effect of educational reminder messages on primary care radiology referrals. *Clin Radiol* 2003;**58**:319–21. http://dx.doi.org/10.1016/S0009-9260(02)00524-X

28. Shariff ZR, Roshan A, Williams AM, Platt AJ. 2-week wait referrals in suspected skin cancer: does an instructional module for general practitioners improve diagnostic accuracy? *Surgeon* 2010;**8**:247–51. http://dx.doi.org/10.1016/j.surge.2010.03.004

29. Kousgaard KR, Nielsen JD, Olesen F, Jensen AB. General practitioner assessment of structured oncological information accompanying newly referred cancer patients. *Scand J Prim Health Care* 2003;**21**:110–14. http://dx.doi.org/10.1080/02813430310001725

30. Bennett K, Haggard M, Churchill R, Wood S. Improving referrals for glue ear from primary care: are multiple interventions better than one alone? *J Health Serv Res Policy* 2001;**6**:139–44. http://dx.doi.org/10.1258/1355819011927387

31. Donohoe ME, Fletton JA, Hook A, Powell R, Robinson I, Stead JW, *et al.* Improving foot care for people with diabetes mellitus – a randomised controlled trial of an integrated care approach. *Diabet Med* 2000;**17**:581–7. http://dx.doi.org/10.1046/j.1464-5491.2000.00336.x

32. Watson E, Clements A, Yudkin P, Rose P, Bukach C, Mackay J, *et al.* Evaluation of the impact of two educational interventions on GP management of familial breast/ovarian cancer cases: a cluster randomised controlled trial. *Br J Gen Pract* 2001;**51**:817–21.

33. Adams SGP, Pitts J, Wynne J, Yawn BP, Diamond EJ, Lee S, *et al.* Effect of a primary care continuing education program on clinical practice of chronic obstructive pulmonary disease: translating theory into practice. *Mayo Clin Proc* 2012;**87**:862–70. http://dx.doi.org/10.1016/j.mayocp.2012.02.028

34. Hands S, Holbrook J. Are one-to-one outpatient teaching sessions a useful way for GPs to undertake their continuing education? *Educ* 2001;**12**:392–400.

35. Suris X, Cerda D, Ortiz-Santamaria V, Ponce A, Simon JL, Calvo E, *et al.* A rheumatology consultancy program with general practitioners in Catalonia, Spain. *J Rheumatol* 2007;**34**:1328–31.

36. Wolters R, Wensing M, Klomp M, Lagro-Jansen T, van Weel C, Grol R. Effects of distance learning on clinical management of LUTS in primary care: a randomised trial. *Patient Educ Couns* 2005;**59**:212–18. http://dx.doi.org/10.1016/j.pec.2004.11.009

37. Bhalla RK, Unwin D, Jones TM, Lesser T. Does clinical assistant experience in ENT influence general practitioner referral rates to hospital? *J Laryngol Otol* 2002;**116**:586–8. http://dx.doi.org/10.1258/00222150260171542

38. Ellard R, Gulati A, Hubbard V, Bull R, Pozo-Garcia L, Goldsmith P. The impact of physician education on primary care referrals in dermatology. *Br J Dermatol* 2012;**167**:40.

39. Lester H, Birchwood M, Freemantle N, Michail M, Tait L. REDIRECT: cluster randomised controlled trial of GP training in first-episode psychosis. *Br J Gen Pract* 2009;**59**:e183–90. http://dx.doi.org/10.3399/bjgp09X420851

40. Emmerson B, Frost A, Powell J, Ward W, Barnes M, Frank RE-MA, *et al.* Evaluating a GP consultative psychiatric service in an Australian metropolitan hospital district. *Australas* 2003;**11**:195–8. http://dx.doi.org/10.1046/j.1039-8562.2003.00547.x

41. Malik A, Wigney L, Murray S, Gerrand CH. The effectiveness of 'two-week' referrals for suspected bone and soft tissue sarcoma. *Sarcoma* 2007;**11**:1–3. http://dx.doi.org/10.1155/2007/23870

42. Twomey P. Making the best use of a radiology department: an example of implementation of a referral guideline within a primary care organisation. *Qual Prim Care* 2003;**11**:53–9.

43. Cusack CM, Buckley CC. Efficacy of issuing guidelines on acne management to general practitioners. *Br J Dermatol* 2005;**152**:1392–3. http://dx.doi.org/10.1111/j.1365-2133.2005.06641.x

44. Idiculla JM, Perros P, Frier BM. Do diabetes guidelines influence the content of referral letters by general practitioners to a diabetes specialist clinic? *Health Bull (Edinb)* 2000;**58**:322–7.

45. Lucassen AW, Watson E, Harcourt J, Rose P, O'Grady J. Guidelines for referral to a regional genetics service: GPs respond by referring more appropriate cases. *Fam Pract* 2001;**18**:135–40. http://dx.doi.org/10.1093/fampra/18.2.135

46. Potter S, Govindarajulu S, Shere M, Braddon F, Curran G, Greenwood R, *et al.* Referral patterns, cancer diagnoses, and waiting times after introduction of two week wait rule for breast cancer: prospective cohort study. *BMJ* 2007;**335**:288–90. http://dx.doi.org/10.1136/bmj.39258.688553.55

47. Imkampe A, Bendall S, Chianakwalam C. Two-week rule: has prioritisation of breast referrals by general practitioners improved? *Breast* 2006;**15**:654–8. http://dx.doi.org/10.1016/j.breast.2006.02.002

48. Fearn S, Larner J. Have Quality and Outcomes Framework Depression Indicators changed referrals from primary care to a dedicated memory clinic? *Ment Health Fam Med* 2009;**6**:129–32.

49. Hill VAW, Wong E, Hart CJ. General practitioner referral guidelines for dermatology: do they improve the quality of referrals? *Clin Exp Dermatol* 2000;**25**:371–6. http://dx.doi.org/10.1046/j.1365-2230.2000.00665.x

50. Matowe L, Ramsay CR, Grimshaw JM, Gilbert FJ, Macleod MJ, Needham G, *et al.* Effects of mailed dissemination of the Royal College of Radiologists' guidelines on general practitioner referrals for radiography: a time series analysis. *Clin Radiol* 2002;**57**:575–8. http://dx.doi.org/10.1053/crad.2001.0894

51. Melia J, Coulson P, Coleman D, Moss S. Urological referral of asymptomatic men in general practice in England. *Br J Cancer* 2008;**98**:1176–81. http://dx.doi.org/10.1038/sj.bjc.6604291

52. West YRK, Kendrick BL, Williamson DM. Evaluation of the impact of orthopaedic guidelines on referrals from primary care to a specialist department. *Qual Prim Care* 2007;**15**:27–31.

53. Banait G, Sibbald B, Thompson D, Summerton C, Hann M, Talbot S. Modifying dyspepsia management in primary care: a cluster randomised controlled trial of educational outreach compared with passive guideline dissemination. *Br J Gen Pract* 2003;**53**:94–100.

54. Eccles M, Steen N, Grimshaw J, Thomas L, McNamee P, Soutter J, *et al.* Effect of audit and feedback, and reminder messages on primary-care radiology referrals: a randomised trial. *Lancet* 2001;**357**:1406–9. http://dx.doi.org/10.1016/S0140-6736(00)04564-5

55. Elwyn G, Owen D, Roberts L, Wareham K, Duane P, Allison M, *et al.* Influencing referral practice using feedback of adherence to NICE guidelines: a quality improvement report for dyspepsia. *Qual Saf Health Care* 2007;**16**:67–70. http://dx.doi.org/10.1136/qshc.2006.019992

56. Wright J, Harrison S, McGeorge M, Patterson C, Russell I, Russell D, *et al.* Improving the management and referral of patients with transient ischaemic attacks: a change strategy for a health community. *Qual Saf Health Care* 2006;**15**:9–12 http://dx.doi.org/10.1136/qshc.2005.014704

57. Glaves J. The use of radiological guidelines to achieve a sustained reduction in the number of radiographic examinations of the cervical spine, lumbar spine and knees performed for GPs. *Clin Radiol* 2005;**60**:914–20. http://dx.doi.org/10.1016/j.crad.2005.02.013

58. Griffiths C, Taylor H, Collins SI, Hobson JE, Collier PA, Chalmers RJ, Stewart EJ, Dey P. The impact of psoriasis guidelines on appropriateness of referral from primary to secondary care: a randomised controlled trial. British Association of Dermatologists 86th Annual Meeting, abstract O-2. *Br J Dermatol* 2006;**155**:1. http://dx.doi.org/10.1111/j.1365-2133.2006.07343.x

59. Kerry S, Oakeshott P, Dundas D, Williams J. Influence of postal distribution of the Royal College of Radiologists' guidelines, together with feedback on radiological referral rates, on X-ray referrals from general practice: a randomised controlled trial. *Fam Pract* 2000;**17**:46–52. http://dx.doi.org/10.1093/fampra/17.1.46

60. Robling MR, Houston HL, Kinnersley P, Hourihan MD, Cohen DR, Hale J, *et al.* General practitioners' use of magnetic resonance imaging: an open randomised trial comparing telephone and written requests and an open randomised controlled trial of different methods of local guideline dissemination. *Clin Radiol* 2002;**57**:402–7. http://dx.doi.org/10.1053/crad.2001.0864

61. White T, Marriott S. Using evidence-based dissemination and implementation strategies to improve routine communication between general practitioners and community mental health teams. *Psychiatr Bull* 2004;**28**:8–11. http://dx.doi.org/10.1192/pb.28.1.8

62. Julian S, Naftalin NJ, Clark M, Szczepura A, Rashid A, Baker R, *et al.* An integrated care pathway for menorrhagia across the primary–secondary interface: patients' experience, clinical outcomes, and service utilisation. *Qual Saf Health Care* 2007;**16**:115. http://dx.doi.org/10.1136/qshc.2005.016782

63. Walkowski K, Peel C, Sandy L. Effect of academic detailing on primary care referral patterns to high performing cardiac specialists. *J Gen Intern Med* 2007;**22**:196–7.

64. Morrison J, Carroll L, Twaddle S, Cameron I, Grimshaw J, Leyland A, *et al.* Pragmatic randomised controlled trial to evaluate guidelines for the management of infertility across the primary care–secondary care interface. *BMJ* 2001;**322**:1282–4. http://dx.doi.org/10.1136/bmj.322.7297.1282

65. Wilson BJ, Torrance N, Mollison J, Watson MS, Douglas A, Miedzybrodzka Z, *et al.* Cluster randomised trial of a multifaceted primary care decision-support intervention for inherited breast cancer risk. *Fam Pract* 2006;**23**:537–44. http://dx.doi.org/10.1093/fampra/cml026

66. Dey P, Simpson CW, Collins SI, Hodgson G, Dowrick CF, Simison AJ, *et al.* Implementation of RCGP guidelines for acute low back pain: a cluster randomised controlled trial. *Br J Gen Pract* 2004;**54**:33–7.

67. Engers AJ, Wensing M, van Tulder MW, Timmermans A, Oostendorp RAB, Koes BW, *et al.* Implementation of the Dutch low back pain guideline for general practitioners: a cluster randomised controlled trial. *Spine* 2005;**30**:595–600. http://dx.doi.org/10.1097/01.brs.0000155406.79479.3a

68. Jiwa MS, Skinner P, Coker AO, Shaw L, Campbell MJ, Thompson J. Implementing referral guidelines: lessons from a negative outcome cluster randomised factorial trial in general practice. *BMC Fam Pract* 2006;**7**:65. http://dx.doi.org/10.1186/1471-2296-7-65

69. Spatafora S, Canepa G, Migliari R, Rotondo S, Mandressi A, Puppo P, *et al.* Effects of a shared protocol between urologists and general practitioners on referral patterns and initial diagnostic management of men with lower urinary tract symptoms in Italy: the Prostate Destination study. *BJU Int* 2005;**95**:563–70. http://dx.doi.org/10.1111/j.1464-410X.2005.05340.x

70. Bridgman S, Li X, Mackenzie G, Dawes P. Does the North Staffordshire slot system control demand of orthopaedic referrals from primary care? A population-based survey in general practice. *Br J Gen Pract* 2005;**55**:704–9.

71. Khan A, Smith DA, Whittaker J, Williams A, Khan D, Harvey JE, *et al.* Effectiveness of direct GP referrals to hospital specialist respiratory teams in avoiding acute admissions. *Thorax* 2008;**63**:A13.

72. Sved-Williams A, Poulton JE. Primary care mental health consultation-liaison: a connecting system for private psychiatrists and general practitioners. *Australas Psychiatry* 2010;**18**:125–9. http://dx.doi.org/10.3109/10398560903469783

73. Hemingway DM, Jameson J, Kelly MJ. Leicester Colorectal Specialist Interest Group Project Steering Committee. Straight to test: introduction of a city-wide protocol driven investigation of suspected colorectal cancer. *Colorectal Dis* 2006;**8**:289–95. http://dx.doi.org/10.1111/j.1463-1318.2005.00935.x

74. McNally OM, Wareham V, Flemming DJ, Cruickshank ME, Parkin DE, McNally OM, *et al.* The impact of the introduction of a fast track clinic on ovarian cancer referral patterns. *Eur J Cancer Care (Engl)* 2003;**12**:327–30. http://dx.doi.org/10.1046/j.1365-2354.2003.00419.x

75. Prades J, Espinas JA, Font R, Argimon JM, Borras JM. Implementing a cancer fast-track programme between primary and specialised care in Catalonia (Spain): a mixed methods study. *Br J Cancer* 2011;**105**:753–9. http://dx.doi.org/10.1038/bjc.2011.308

76. DAMASK (Direct Access to Magnetic Resonance Imaging: Assessment for Suspect Knees) Trial Team. Cost-effectiveness of magnetic resonance imaging of the knee for patients presenting in primary care. *Br J Gen Pract* 2008;**58**:e10–16. http://dx.doi.org/10.3399/bjgp08X342660

77. Shaw IS, Valori RM, Charlett A, McNulty CA. Limited impact on endoscopy demand from a primary care based 'test and treat' dyspepsia management strategy: the results of a randomised controlled trial. *Br J Gen Pract* 2006;**56**:369–74.

78. Simpson GC, Forbes K, Teasdale E, Tyagi A, Santosh C. Impact of GP direct-access computerised tomography for the investigation of chronic daily headache. *Br J Gen Pract* 2010;**60**:897–901. http://dx.doi.org/10.3399/bjgp10X544069

79. Thomas RE, Grimshaw JM, Mollison J, McClinton S, McIntosh E, Deans H, *et al.* Cluster randomised trial of a guideline-based open access urological investigation service. *Fam Pract* 2003;**20**:646–54. http://dx.doi.org/10.1093/fampra/cmg605

80. Thomas R, Cook A, Main G, Taylor T, Galizia CE, Swingler R, *et al.* Primary care access to computed tomography for chronic headache. *Br J Gen Pract* 2010;**60**:426–30. http://dx.doi.org/10.3399/bjgp10X502146

81. Wong BC, Chan CK, Wong KW, Wong WM, Yuen MF, Lai KC, *et al.* Evaluation of a new referral system for the management of dyspepsia in Hong Kong: role of open-access upper endoscopy. *J Gastroenterol Hepatol* 2000;**15**:1251–6. http://dx.doi.org/10.1046/j.1440-1746.2000.2353.x

82. Dhillon V, Creiger J, Hannan J, Hurst N, Nuki G. The effect of DXA scanning on clinical decision making by general practitioners: a randomised, prospective trial of direct access versus referral to a hospital consultant. *Osteoporos Int* 2003;**14**:326–33. http://dx.doi.org/10.1007/s00198-002-1371-2

83. Eley KA, Fitzgerald JE. Direct general practitioner referrals to audiology for the provision of hearing aids: a single centre review. *Qual Prim Care* 2010;**18**:201–6.

84. Gough-Palmer AL, Burnett C, Gedroyc WM. Open access to MRI for general practitioners: 12 years' experience at one institution – a retrospective analysis. *Br J Radiol* 2009;**82**:687–90. http://dx.doi.org/10.1259/bjr/88267089

85. Leggett P, Gilliland AE, Cupples ME, McGlade K, Corbett R, Stevenson M, *et al.* A randomised controlled trial using instant photography to diagnose and manage dermatology referrals. *Fam Pract* 2004;**21**:54–6. http://dx.doi.org/10.1093/fampra/cmh112

86. Eminovic N, de Keizer NF, Wyatt JC, ter Riet G, Peek N, van Weert HC, *et al.* Teledermatologic consultation and reduction in referrals to dermatologists: a cluster randomised controlled trial. *Arch Dermatol* 2009;**145**:558–64. http://dx.doi.org/10.1001/archdermatol.2009.44

87. Whited JD, Hall RP, Foy ME, Marbrey LE, Grambow SC, Dudley TK, *et al.* Teledermatology's impact on time to intervention among referrals to a dermatology consult service. *Telemed J E Health* 2002;**8**:313–21. http://dx.doi.org/10.1089/15305620260353207

88. Whited JD, Hall RP, Foy ME, Marbrey LE, Grambow SC, Dudley TK, *et al.* Patient and clinician satisfaction with a store-and-forward teledermatology consult system. *Telemed J E Health* 2004;**10**:422–31. http://dx.doi.org/10.1089/tmj.2004.10.422

89. McKoy KC, DiGregorio S, Stira L. Asynchronous teledermatology in an urban primary care practice. *Telemed J E Health* 2004;**10**:S70–80. http://dx.doi.org/10.1089/1530562042632001

90. Knol A, van den Akker TW, Damstra RJ, de Haan J. Teledermatology reduces the number of patient referrals to a dermatologist. *J Telemed Telecare* 2006;**12**:75–8. http://dx.doi.org/10.1258/135763306776084365

91. Hockey AD, Wootton R, Casey T. Trial of low-cost teledermatology in primary care. *J Telemed Telecare* 2004;**10**(Suppl. 1):44–7. http://dx.doi.org/10.1258/1357633042614221

92. Nielsen JDP, Palshof T, Mainz J, Jensen AB, Olesen F. Randomised controlled trial of a shared care programme for newly referred cancer patients: bridging the gap between general practice and hospital. *Qual Saf Health Care* 2003;**12**:263–72. http://dx.doi.org/10.1136/qhc.12.4.263

93. Harrington JT, Dopf CA, Chalgren CS. Implementing guidelines for interdisciplinary care of low back pain: a critical role for pre-appointment management of specialty referrals. *Jt Comm J Qual Improv* 2001;**27**:651–63.

94. Wallace P, Barber J, Clayton W, Currell R, Fleming K, Garner P, *et al.* Virtual outreach: a randomised controlled trial and economic evaluation of joint teleconferenced medical consultations. *Health Technol Assess* 2004;**8**(50). http://dx.doi.org/10.3310/hta8500

95. Jaatinen T, Aarnio P, Remes J, Hannukainen J, Koymari S. Teleconsultation as a replacement for referral to an outpatient clinic. *J Telemed Telecare* 2002;**8**:102–6. http://dx.doi.org/10.1258/1357633021937550

96. Tadros A, Murdoch R, Stevenson JH. Digital image referral for suspected skin malignancy – a pilot study of 300 patients. *J Plast Reconstr Aesthet Surg* 2009;**62**:1048–53. http://dx.doi.org/10.1016/j.bjps.2008.02.005

97. Nicholson C, Jackson CL, Wright B, Mainwaring P, Holliday D, Lankowski A, *et al.* Online referral and OPD booking from the GP desktop. *Aust Health Rev* 2006;**30**:397–404. http://dx.doi.org/10.1071/AH060397

98. Kim Y, Chen AH, Keith E, Yee HF Jr, Kushel MB. Not perfect, but better: primary care providers' experiences with electronic referrals in a safety net health system. *J Gen Intern Med* 2009;**24**:614–19. http://dx.doi.org/10.1007/s11606-009-0955-3

99. Dennison J, Eisen S, Towers M, Ingham CC. An effective electronic surgical referral system. *Ann R Coll Surg Engl* 2006;**88**:554–6. http://dx.doi.org/10.1308/003588406X130642

100. Chen AH, Kushel MB, Grumbach K, Yee HF Jr. A safety-net system gains efficiencies through 'eReferrals' to specialists. *Health Affairs* 2010;**29**:969–71. http://dx.doi.org/10.1377/hlthaff.2010.0027

101. Gandhi TK, Sittig DF, Franklin M, Sussman AJ, Fairchild DG, Bates DW, *et al.* Communication breakdown in the outpatient referral process. *J Gen Intern Med* 2000;**15**:626–31. http://dx.doi.org/10.1046/j.1525-1497.2000.91119.x

102. Kim-Hwang JE, Chen AH, Bell DS, Guzman D, Yee HF Jr, Kushel MB. Evaluating electronic referrals for specialty care at a public hospital. *J Gen Intern Med* 2010;**25**:1123–8. http://dx.doi.org/10.1007/s11606-010-1402-1

103. Stoves J, Connolly J, Cheung C. Electronic consultation as an alternative to hospital referral for patients with chronic kidney disease: a novel application for networked electronic health records to improve the accessibility and efficiency of healthcare. *BMJ Quality and Safety* 2010;**19**:1–4. http://dx.doi.org/10.1136/qshc.2009.038984

104. Patterson V, Humphreys J, Chua R. E-mail triage of new neurological outpatient referrals from general practice. *J Neurol Neurosurg Psychiatry* 2004;**75**:617–20. http://dx.doi.org/10.1136/jnnp.2003.024489

105. Jiwa MD, Dhaliwal S. Referral Writer: preliminary evidence for the value of comprehensive referral letters. *Qual Prim Care* 2012;**20**:39–45.

106. Kennedy AM, Aziz A, Khalid S, Hurman D. Do GP referral guidelines really work? Audit of an electronic urgent referral system for suspected head and neck cancer. *Eur Arch Otorhinolaryngol* 2012;**269**:1509–12. http://dx.doi.org/10.1007/s00405-011-1788-3

107. McGowan J, Hogg W, Campbell C, Rowan M. Just-in-time information improved decision-making in primary care: a randomised controlled trial. *PLOS ONE* 2008;**3**:e3785. http://dx.doi.org/10.1371/journal.pone.0003785

108. Gandhi TK, Keating NL, Ditmore M, Kiernan D, Johnson R, Burdick E, *et al.* Improving Referral Communication Using a Referral Tool Within an Electronic Medical Record. In Henriksen K, Battles JB, Keyes MA, Grady ML, editors. *Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools)*. Rockville, MD: Agency for Healthcare Research and Quality; 2008. URL: www.ncbi.nlm.nih.gov/books/NBK43671 (accessed 11 March 2014).

109. Junghans C, Feder G, Timmis AD, Eldridge S, Sekhri N, Black N, *et al.* Effect of patient-specific ratings vs conventional guidelines on investigation decisions in angina – appropriateness of referral and investigation in angina (ARIA) trial. *Arch Intern Med* 2007;**167**:195–202. http://dx.doi.org/10.1001/archinte.167.2.195

110. Akbari A, Grimshaw J, Stacey D, Hogg W, Ramsay T, Cheng-Fitzpatrick M, *et al.* Change in appropriate referrals to nephrologists after the introduction of automatic reporting of the estimated glomerular filtration rate. *CMAJ* 2012;**184**:E269–76. http://dx.doi.org/10.1503/cmaj.110678

111. Emery J, Morris H, Goodchild R, Fanshawe T, Prevost AT, Bobrow M, *et al.* The GRAIDS trial: a cluster randomised controlled trial of computer decision support for the management of familial cancer risk in primary care. *Br J Cancer* 2007;**97**:486–93. http://dx.doi.org/10.1038/sj.bjc.6603897

112. Knab JH, Wallace MS, Wagner RL, Tsoukatos J, Weinger MB. The use of a computer-based decision support system facilitates primary care physicians' management of chronic pain. *Anaesth Analg* 2001;**93**:712–20. http://dx.doi.org/10.1097/00000539-200109000-00035

113. Mariotti G, Meggio A, de Pretis G, Gentilini M. Improving the appropriateness of referrals and waiting times for endoscopic procedures. *J Health Serv Res Policy* 2008;**13**:146–51. http://dx.doi.org/10.1258/jhsrp.2008.007170

114. Greiver M, Drummond N, White D, Weshler J, Moineddin R. Angina on the Palm: randomised controlled pilot trial of Palm PDA software for referrals for cardiac testing. *Can Fam Physician* 2005;**51**:382–3.

115. Magill MK, Day J, Mervis A, Donnelly SM, Parsons M, Baker AN, *et al.* Improving colonoscopy referral rates through computer-supported, primary care practice redesign. *J Healthc Qual* 2009;**31**:43–52. http://dx.doi.org/10.1111/j.1945-1474.2009.00037.x

116. Tierney WMO, Overhage JM, Murray MD, Harris LE, Zhou XH, Eckert GJ, *et al.* Effects of computerised guidelines for managing heart disease in primary care: a randomised, controlled trial. *J Gen Intern Med* 2003;**18**:967–76. http://dx.doi.org/10.1111/j.1525-1497.2003.30635.x

117. Slade M, Gask L, Leese M, McCrone P, Montana C, Powell R, *et al.* Failure to improve appropriateness of referrals to adult community mental health services – lessons from a multi-site cluster randomised controlled trial. *Fam Pract* 2008;**25**:181–90. http://dx.doi.org/10.1093/fampra/cmn025

118. Stainkey LA, Seidl IA, Johnson AJ, Tulloch GE, Pain T. The challenge of long waiting lists: how we implemented a GP referral system for non-urgent specialist' appointments at an Australian public hospital. *BMC Health Serv Res* 2010;**10**:303. http://dx.doi.org/10.1186/1472-6963-10-303

119. King RHB, Bateman H. Piloting an approach to the identification of avoidable referrals in a general practice with a high referral rate. *J Clin Excel* 2001;**2**:209–13.

120. van Bokhoven MA, Koch H, van der Weijden T, Weekers-Muyres AH, Bindels PJ, Grol RP, *et al.* The effect of watchful waiting compared to immediate test ordering instructions on general practitioners' blood test ordering behaviour for patients with unexplained complaints; a randomised clinical trial (ISRCTN55755886). *Implement Sci* 2012;**7**:29. http://dx.doi.org/10.1186/1748-5908-7-29

121. Callaway P, Frisch L. Does a family physician who offers colposcopy and LEEP need to refer patients to a gynaecologist? *J Fam Pract* 2000;**49**:534–6.

122. Standing PD. Changes in referral patterns to cardiac out-patient clinics with ambulatory ECG monitoring in general practice. *Br J Cardiol* 2001;**8**:394–9.

123. van Dijk CE, Verheij RA, Spreeuwenberg P, Groenewegen PP, de Bakker DH, van Dijk CE, *et al.* Minor surgery in general practice and effects on referrals to hospital care: observational study. *BMC Health Serv Res* 2011;**11**:2. http://dx.doi.org/10.1186/1472-6963-11-2

124. Ridsdale L, Doherty J, McCrone P, Seed P. Headache Innovation and Evaluation Group. A new GP with special interest headache service: observational study. *Br J Gen Pract* 2008;**58**:478–83. http://dx.doi.org/10.3399/bjgp08X319440

125. Salisbury C, Noble A, Horrocks S, Crosby Z, Harrison V, Coast J, *et al.* Evaluation of a general practitioner with special interest service for dermatology: randomised controlled trial. *BMJ* 2005;**331**:1441–6. http://dx.doi.org/10.1136/bmj.38670.494734.7C

126. Sanderson D. *Evaluation of the GPs with Special Interests (GPwSIs) Pilot Projects within the Action On ENT Programme: Final Report*. Department of Health Modernisation Agency, York Health Economics Consortium; 2002.

127. Sauro AS, Scalzitti F, Buono N, Siringano R, Petrazzuoli F, Diodati G, *et al.* Spirometry is really useful and feasible in the GPs' daily practice but guidelines alone are not. *Eur J Gen Pract* 2005;**11**:29–31. http://dx.doi.org/10.3109/13814780509178015

128. Rosen R, Jones R, Tomlin Z, Cavanagh M. *Evaluation of General Practitioners with Special Interests: Access, Cost Evaluation and Satisfaction with Services*. NIHR Service Delivery and Organisation; 2006. URL: www.nets.nihr.ac.uk/__data/assets/pdf_file/0005/64445/FR-08–1210–035.pdf (accessed 14 January 2014).

129. Levell NJ, Penart-Lanau AM, Garioch JJ. Introduction of intermediate care dermatology services in Norfolk, England was followed by a 67% increase in referrals to the local secondary care dermatology department. *Br J Dermatol* 2012;**167**:443–5. http://dx.doi.org/10.1111/j.1365-2133.2012.10850.x

130. Leiba AM, Martonovits G, Magnezi R, Goldberg A, Carroll J, Benedek P, *et al.* Evaluation of a specialist outreach clinic in a primary healthcare setting: the effect of easy access to specialists. *Clinician Manag* 2002;**11**:131–6.

131. Campbell H, Holloway S, Cetnarskyj R, Anderson E, Rush R, Fry A, *et al.* Referrals of women with a family history of breast cancer from primary care to cancer genetics services in South East Scotland. *Br J Cancer* 2003;**89**:1650–6. http://dx.doi.org/10.1038/sj.bjc.6601348

132. Felker BL, Barnes RF, Greenberg DM, Chaney EF, Shores MM, Gillespie-Gateley L, *et al.* Preliminary outcomes from an integrated mental health primary care team. *Psychiatr Serv* 2004;**55**:442–4. http://dx.doi.org/10.1176/appi.ps.55.4.442

133. Gurden M, Morelli M, Sharp G, Baker K, Betts N, Bolton J, *et al.* Evaluation of a general practitioner referral service for manual treatment of back and neck pain. *Prim Health Care Res Dev* 2012;**13**:204–10. http://dx.doi.org/10.1017/S1463423611000648

134. Schulpen GJ, Vierhout WP, van der Heijde DM, Landewe RB, Winkens RA, van der Linden S, *et al.* Joint consultation of general practitioner and rheumatologist: does it matter? *Ann Rheum Dis* 2003;**62**:159–61. http://dx.doi.org/10.1136/ard.62.2.159

135. Vlek JF, Vierhout WP, Knottnerus JA, Schmitz JJ, Winter J, Wesselingh-Megens AM, *et al.* A randomised controlled trial of joint consultations with general practitioners and cardiologists in primary care. *Br J Gen Pract* 2003;**53**:108–12.

136. Hughes-Anderson W, Rankin SL, House J, Aitken J, Heath D, House AK, *et al.* Open access endoscopy in rural and remote Western Australia: does it work? *ANZ J Surg* 2002;**72**:699–703. http://dx.doi.org/10.1046/j.1445-2197.2002.02535.x

137. Hermush V, Daliot D, Weiss A, Brill S, Beloosesky Y. The impact of geriatric consultation on the care of the elders in community clinics. *Arch Gerontol Geriatr* 2009;**49**:260–2. http://dx.doi.org/10.1016/j.archger.2008.09.007

138. Pfeiffer PN, Szymanski BR, Zivin K, Post EP, Valenstein M, McCarthy JF, *et al.* Are primary care mental health services associated with differences in specialty mental health clinic use? *Psychiatr Serv* 2011;**62**:422–5. http://dx.doi.org/10.1176/ps.62.4.pss6204_0422

139. Johnson G, White A, Livingstone R. Do general practices which provide an acupuncture service have low referral rates and prescription costs? A pilot survey. *Acupunct Med* 2008;**26**:205–13. http://dx.doi.org/10.1136/aim.26.4.205

140. Tan E, Levell NJ, Garioch JJ. The effect of a dermatology restricted-referral list upon the volume of referrals. *Clin Exp Dermatol* 2007;**32**:114–15.

141. van Dijk CE, Verheij RA, Hansen J, van d, V, Nijpels G, Groenewegen PP, *et al.* Primary care nurses: effects on secondary care referrals for diabetes. *BMC Health Serv Res* 2010;**10**:230. http://dx.doi.org/10.1186/1472-6963-10-230

142. White M, Bijlani N, Bale R, Burns T. Impact of counsellors in primary care on referrals to secondary mental health services. *Psychiatr Bull* 2000;**24**:418–20. http://dx.doi.org/10.1192/pb.24.11.418

143. Simpson S, Corney R, Fitzgerald P. Counselling provision, prescribing and referral rates in a general practice setting. *Prim Care Psychiatry* 2003;**8**:115–19. http://dx.doi.org/10.1185/135525703125001857

144. Schillinger D, Bibbins-Domingo K, Vranizan K, Bacchetti P, Luce JM, Bindman AB, *et al.* Effects of primary care coordination on public hospital patients. *J Gen Intern Med* 2000;**15**:329–36. http://dx.doi.org/10.1046/j.1525-1497.2000.07010.x

145. Ferris TG, Chang Y, Blumenthal D, Pearson SD. Leaving gatekeeping behind – effects of opening access to specialists for adults in a health maintenance organisation. *N Engl J Med* 2001;**345**:1312–17. http://dx.doi.org/10.1056/NEJMsa010097

146. Ferris TG, Chang Y, Perrin JM, Blumenthal D, Pearson SD. Effects of removing gatekeeping on specialist utilisation by children in a Health Maintenance Organisation. *Arch Pediatr Adolesc Med* 2002;**156**:574–9. http://dx.doi.org/10.1001/archpedi.156.6.574

147. Joyce GF, Kapur K, Van Vorst KA, Escarce JJ. Visits to primary care physicians and to specialists under gatekeeper and point-of-service arrangements. *Am J Manag Care* 2000;**6**:1189–96.

148. McGarry HH, Hegarty K, Johnson C, Gunn J, Blashki G. Managing depression in a changing primary mental healthcare system: comparison of two snapshots of Australian GPs' treatment and referral patterns. *Ment Health Fam Med* 2009;**6**:75–83.

149. van Dijk CE, Verheij RA, Spreeuwenberg P, Van den Berg MJ, Groenewegen PP, Braspenning J, *et al.* Impact of remuneration on guideline adherence: empirical evidence in general practice. *Scand J Prim Health Care* 2013;**31**:56–63. http://dx.doi.org/10.3109/02813432.2012.757078

150. Vardy DA, Freud T, Sherf M, Spilberg O, Goldfarb D, Cohen AD, *et al.* A co-payment for consultant services: primary care physicians' referral actualisation. *J Med Syst* 2008;**32**:37–41. http://dx.doi.org/10.1007/s10916-007-9105-9

151. Iversen T, Luras H. The effect of capitation on GPs' referral decisions. *Health Econ* 2000;**9**:199–210. http://dx.doi.org/10.1002/(SICI)1099-1050(200004)9:3<199::AID-HEC514>3.0.CO;2-2

152. Watson E, Clements A, Lucassen A, Yudkin P, Mackay J, Austoker J. Education improves general practitioner (GP) management of familial breast/ovarian cancer: findings from a cluster randomised controlled trial. *J Med Genet* 2002;**39**:779–81. http://dx.doi.org/10.1136/jmg.39.10.779

153. Whiting M. Introducing a GP-led referral gateway. *Pulse* 2011;**71**:29–30.

154. Maddison P, Jones J, Breslin A, Carton C, Fleur J. Improved access and targeting of musculoskeletal services in northwest Wales: targeted early access to musculoskeletal services (TEAMS) programme. *BMJ* 2004;**329**:1325–7. http://dx.doi.org/10.1136/bmj.329.7478.1325

155. Kim C, Williamson DF, Herman WH, Safford MM, Selby JV, Marrero DG, *et al.* Referral management and the care of patients with diabetes: the Translating Research into Action for Diabetes (TRIAD) study. *Am J Manag Care* 2004;**10**:137–43.

156. Cox JMS, Steel N, Clark AB, Kumaravel B, Bachmann MO. Do referrral management schemes reduce hospital outpatient attendances? *Br J Gen Pract* 2013;**63**:299–300. http://dx.doi.org/10.3399/bjgp13X668177

157. Ferriter K, Gangopadhyay P, Nilforooshan R. Quality of referrals to old age psychiatry following introduction of the single assessment process. *Psychiatr Bull* 2006;**30**:1930. http://dx.doi.org/10.1192/pb.30.12.452

158. Albertson G, Lin CT, Schilling L, Cyran E, Anderson S, Anderson RJ, *et al.* Impact of a simple intervention to increase primary care provider recognition of patient referral concerns. *Am J Manag Care* 2002;**8**:375–81.

159. Heaney D, Wyke S, Wilson P, Elton R, Rutledge P. Assessment of impact of information booklets on use of healthcare services: randomised controlled trial. *BMJ* 2001;**322**:1218–21. http://dx.doi.org/10.1136/bmj.322.7296.1218

160. Lyon D, Knowles J, Slater B, Kennedy R. Improving the early presentation of cancer symptoms in disadvantaged communities: putting local people in control. *Br J Cancer* 2009;**101**(Suppl. 2):49–54. http://dx.doi.org/10.1038/sj.bjc.6605390

161. Delva F, Marien E, Fonck M, Rainfray M, Demeaux JL, Moreaud P, *et al.* Factors influencing general practitioners in the referral of elderly cancer patients. *BMC Cancer* 2011;**11**:5. http://dx.doi.org/10.1186/1471-2407-11-5

162. Fucito LMG, Gomes B, Murnion B, Haber P. General practitioners' diagnostic skills and referral practices in managing patients with drug and alcohol-related health problems: implications for medical training and education programmes. *Drug Alcohol Rev* 2003;**22**:417–24. http://dx.doi.org/10.1080/09595230310001613930

163. Scheeres K, Wensing M, Mes C, Bleijenberg G. The impact of informational interventions about cognitive behavioural therapy for chronic fatigue syndrome on GPs referral behaviour. *Patient Educ Couns* 2007;**68**:29–32. http://dx.doi.org/10.1016/j.pec.2007.04.002

164. Ringard A. Why do general practitioners abandon the local hospital? An analysis of referral decisions related to elective treatment. *Scand J Public Health* 2010;**38**:597–604. http://dx.doi.org/10.1177/1403494810371019

165. Townsley CA, Naidoo K, Pond GR, Melnick W, Straus SE, Siu LL, *et al.* Are older cancer patients being referred to oncologists? A mail questionnaire of Ontario primary care practitioners to evaluate their referral patterns. *J Clin Oncol* 2003;**21**:4627–35. http://dx.doi.org/10.1200/JCO.2003.06.073

166. Zielinski AH, Håkansson A, Jurgutis A, Ovhed I, Halling A. Differences in referral rates to specialised health care from four primary health care models in Klaipeda, Lithuania. *BMC Fam Pract* 2008;**26**:63. http://dx.doi.org/10.1186/1471-2296-9-63

167. Elhayany A, Shvartzman P, Regev S, Reuveni H, Tabenkin H. Variations in referrals to consultants: a study of general practitioners' characteristics in southern Israel. *J Ambulatory Care Manage* 2000;**23**:45–54. http://dx.doi.org/10.1097/00004479-200001000-00005

168. Kvaerner KJ, Helgaker AB. Otitis media referrals – the general practitioner perspective. *Int J Pediatr Otorhinolaryngol* 2007;**71**:1219–24. http://dx.doi.org/10.1016/j.ijporl.2007.04.012

169. Naccarella L, Pirkis J, Morley B, Kohn F, Blashki G, Burgess PE-MA, *et al.* Managing demand for psychological services within an Australian primary mental healthcare initiative. *Primary Care Community Psychiatry* 2008;**13**:126–33.

170. O'Neill L, Kuder J. Explaining variation in physician practice patterns and their propensities to recommend services. *Med Care Res Rev* 2005;**62**:339–57. http://dx.doi.org/10.1177/1077558705275424

171. Swarztrauber K, Vickrey BG, Mittman BS. Physicians' preferences for specialty involvement in the care of patients with neurological conditions. *Med Care* 2002;**40**:1196–209. http://dx.doi.org/10.1097/00005650-200212000-00007

172. Freed GL, Jee S, Stein L, Spera L, Clark SJ. Comparing the self-reported referral and management preferences of pediatricians and family physicians for children with juvenile rheumatoid arthritis. *J Rheumatol* 2003;**30**:2700–4.

173. Tzaribachev NB, Benseler SM, Tyrrell PN, Meyer A, Kuemmerle-Deschner JB. Predictors of delayed referral to a pediatric rheumatology center. *Arthritis Rheum* 2009;**61**:1367–72. http://dx.doi.org/10.1002/art.24671

174. Dodds W, Morgan M, Wolfe C, Raju KS. Implementing the 2-week wait rule for cancer referral in the UK: general practitioners' views and practices. *Eur J Cancer Care* 2004;**13**:82–7. http://dx.doi.org/10.1111/j.1365-2354.2004.00447.x

175. Lambert MV, Bird JM. The assessment and management of adult patients with epilepsy – the role of general practitioners and the specialist services. *Seizure* 2001;**10**:341–6. http://dx.doi.org/10.1053/seiz.2001.0520

176. Pomeroy SE, Cant RP. General practitioners' decision to refer patients to dietitians: insight into the clinical reasoning process. *Aust J Prim Health* 2010;**16**:147–53. http://dx.doi.org/10.1071/PY09024

177. Knight L. How do GPs make referral and treatment decisions when patients present with mental health problems? *Counsell Psychol Q* 2003;**16**:195–221. http://dx.doi.org/10.1080/0951507031000161092

178. Wassenaar TR, Eickhoff JC, Jarzemsky DR, Smith SS, Larson ML, Schiller JH. Differences in primary care clinicians' approach to non-small cell lung cancer patients compared with breast cancer. *J Thorac Oncol* 2007;**2**:722–8. http://dx.doi.org/10.1097/JTO.0b013e3180cc2599

179. Lakha SF, Yegneswaran B, Furlan JC, Legnini V, Nicholson K, Mailis-Gagnon A. Referring patients with chronic noncancer pain to pain clinics: survey of Ontario family physicians. *Can Fam Physician* 2011;**57**:e106–12.

180. Montgomery AJ, McGee HM, Shannon W, Donohoe J. Factors influencing general practitioner referral of patients developing end-stage renal failure: a standardised case-analysis study. *BMC Health Serv Res* 2006;**6**:114. http://dx.doi.org/10.1186/1472-6963-6-114

181. Jørgensen CK, Olesen F. Predictors for referral to physiotherapy from general practice. *Scand J Prim Health Care* 2001;**19**:48–53. http://dx.doi.org/10.1080/028134301300034684

182. Rowlands G, Willis S, Singleton A. Referrals and relationships: in-practice referrals meetings in a general practice. *Fam Pract* 2001;**18**:399–406. http://dx.doi.org/10.1093/fampra/18.4.399

183. Rushton JB, Bruckman D, Kelleher K. Primary care referral of children with psychosocial problems. *Arch Pediatr Adolesc Med* 2002;**156**:592–8. http://dx.doi.org/10.1001/archpedi.156.6.592

184. Angstman KB, Adamson SC, Furst JW, Houston MS, Rohrer JE. Provider satisfaction with virtual specialist consultations in a family medicine department. *Health Care Manag (Frederick)* 2009;**28**:14–18. http://dx.doi.org/10.1097/HCM.0b013e318196def8

185. Kisely S, Horton-Hausknecht J, Miller K, Mascall C, Tait A, Wong P, *et al.* Increased collaboration between primary care and psychiatric services. A survey of general practitioners' views and referrals. *Aust Fam Physician* 2002;**31**:587–9.

186. Mitchell L, Macdonald-Wicks L, Capra S. Increasing dietetic referrals: perceptions of general practitioners, practice nurses and dietitians. *Nutrition Dietetics* 2012;**69**:32–8. http://dx.doi.org/10.1111/j.1747-0080.2011.01570.x

187. Coulston JE, Williams GL, Stephenson BM. Audit of referral patterns for hernia repair – are general practitioners aware of the changing face of herniorrhaphy? *Ann R Coll Surg Engl* 2008;**90**:140–1. http://dx.doi.org/10.1308/003588408X261573

188. Ramanathan SA, Baratiny G, Stocks NP, Searles AM, Redford RJ. General practitioner referral patterns for women with gynaecological symptoms: a randomised incomplete block study design. *Med J Aust* 2011;**195**:602–6. http://dx.doi.org/10.5694/mja10.10867

189. Blundell N, Taylor-Phillips S, Spitzer D, Martin S, Forde I, Clarke A, *et al.* Elective surgical referral guidelines–background educational material or essential shared decision making tool? A survey of GPs' in England. *BMC Fam Pract* 2011;**12**:92. http://dx.doi.org/10.1186/1471-2296-12-92

190. Clarke A, Nusila M, Le M. *The REFER Project: Realistic Effective Facilitation of Elective Referral for Elective Surgical Assessment*. 2010. URL: www.netscc.ac.uk/hsdr/files/project/SDO_FR_08–1310–072_V01.pdf (accessed 14 January 2014).

191. Kasje WN, Denig P, De Graeff PA, Haaijer-Ruskamp FM. Physicians' views on joint treatment guidelines for primary and secondary care. *Int J Qual Health Care* 2004;**16**:229–36. http://dx.doi.org/10.1093/intqhc/mzh038

192. Baker R, Lecouturier J, Bond S. Explaining variation in GP referral rates for X-rays for back pain. *Implement Sci* 2006;**1**:15. http://dx.doi.org/10.1186/1748-5908-1-15

193. Jiwa M, Gordon M, Arnet H, Ee H, Bulsara M, Colwell B, *et al.* Referring patients to specialists: a structured vignette survey of Australian and British GPs. *BMC Fam Pract* 2008;**9**:2. http://dx.doi.org/10.1186/1471-2296-9-2

194. Ruston A. Risk, anxiety and defensive action: general practitioner's referral decisions for women presenting with breast problems. *Health Risk Soc* 2004;**6**:25. http://dx.doi.org/10.1080/1369857042000193066

195. Watson E, Austoker J, Lucassen. A study of GP referrals to a family cancer clinic for breast/ovarian cancer. *Fam Pract* 2001;**18**:131–4. http://dx.doi.org/10.1093/fampra/18.2.131

196. Bederman SS, McIsaac WJ, Coyte PC, Kreder HJ, Mahomed NN, Wright JG, *et al.* Referral practices for spinal surgery are poorly predicted by clinical guidelines and opinions of primary care physicians. *Med Care* 2010;**48**:852–8. http://dx.doi.org/10.1097/MLR.0b013e3181e3588b

197. Belgamwar B, Bates C, Goes C, Talyor N. Appropriateness of GP referrals of patients with anxiety and depression. *Progress Neurol Psychiatry* 2011;**15**:27–9. http://dx.doi.org/10.1002/pnp.188

198. Tucker JF, Farmer J, Stimpson P. Guidelines and management of mild hypertensive conditions in pregnancy in rural general practices in Scotland: issues of appropriateness and access. *Qual Saf Health Care* 2003;**12**:286–90. http://dx.doi.org/10.1136/qhc.12.4.286

199. Trude S, Stoddard JJ. Referral gridlock: primary care physicians and mental health services. *J Gen Intern Med* 2003;**18**:442–9. http://dx.doi.org/10.1046/j.1525-1497.2003.30216.x

200. Morsi E, Lindenauer PK, Rothberg MB. Primary care physicians' use of publicly reported quality data in hospital referral decisions. *J Hosp Med* 2012;**7**:370–5. http://dx.doi.org/10.1002/jhm.1931

201. Sigel PL, Leiper R. GP views of their management and referral of psychological problems: a qualitative study. *Psychol Psychother* 2004;**77**:279–95. http://dx.doi.org/10.1348/1476083041839394

202. Philichi L, Yuwono M. Primary care: constipation and encopresis treatment strategies and reasons to refer. *Gastroenterol Nurs* 2010;**33**:363–6. http://dx.doi.org/10.1097/SGA.0b013e3181f35020

203. Steele M, Zayed R, Davidson B, Stretch N, Nadeau L, Fleisher W, *et al.* Referral patterns and training needs in psychiatry among primary care physicians in Canadian rural/remote areas. *J Can Acad Child Adolesc Psychiatry* 2012;**21**:111–23.

204. Nandy S, Chalmers-Watson C, Gantley M, Underwood M. Referral for minor mental illness: a qualitative study. *Br J Gen Pract* 2001;**51**:461–5.

205. Moore JL, McAuley JW, Mott D, Reeves AL, Bussa B. Referral characteristics of primary care physicians for seizure patients. *Epilepsia* 2000;**41**:744–8. http://dx.doi.org/10.1111/j.1528-1157.2000.tb00237.x

206. Olson R, Lengoc S, Tyldesley S, French J, McGahan C, Soo J. Relationships between family physicians' referral for palliative radiotherapy, knowledge of indications for radiotherapy, and prior training: a survey of rural and urban family physicians. *Radiation Oncol* 2012;**7**:73. http://dx.doi.org/10.1186/1748-717X-7-73

207. Calnan MP, Payne S, Kemple T, Rossdale M, Ingram J. A qualitative study exploring variations in GPs' out-of-hours referrals to hospital. *Br J Gen Pract* 2007;**57**:706–13.

208. Anthony JS, Baik SY, Bowers BJ, Tidjani B, Jacobson CJ, Susman J, *et al.* Conditions that influence a primary care clinician's decision to refer patients for depression care. *Rehabil Nurs* 2010;**35**:113–22. http://dx.doi.org/10.1002/j.2048-7940.2010.tb00286.x

209. Bruyninckx R, Van den Bruel A, Aertgeerts B, Van CV, Buntinx F. Why does the general practitioner refer patients with chest pain not-urgently to the specialist or urgently to the emergency department? Influence of the certainty of the initial diagnosis. *Acta Cardiol* 2009;**64**:259–65. http://dx.doi.org/10.2143/AC.64.2.2036147

210. Morgan M, Jenkins L, Ridsdale L. Patient pressure for referral for headache: a qualitative study of GPs' referral behaviour. *Br J Gen Pract* 2007;**57**:29–35.

211. Rosemann T, Wensing M, Rueter G, Szecsenyi J. Referrals from general practice to consultants in Germany: if the GP is the initiator, patients' experiences are more positive. *BMC Health Serv Res* 2005;**6**:5. http://dx.doi.org/10.1186/1472-6963-6-5

212. van der Weijden T, van Bokhoven M, Dinant GJ, van Hasselt CM, Grol RPTM. Understanding laboratory testing in diagnostic uncertainty: a qualitative study in general practice. *Br J Gen Pract* 2002;**52**:974–80.

213. Wilkes S, Murdoch A, Steen N, Wilsdon J, Rubin G. Open Access Tubal aSsessment for the initial management of infertility in general practice (the OATS trial): a pragmatic cluster randomised controlled trial. *Br J Gen Pract* 2009;**59**:329–35. http://dx.doi.org/10.3399/bjgp09X420590

214. Ahluwalia SC, Fried TR. Physician factors associated with outpatient palliative care referral. *Palliat Med* 2009;**23**:608–15. http://dx.doi.org/10.1177/0269216309106315

215. Pryor AMR, Knowles AA. The relationship between general practitioners' characteristics and the extent to which they refer clients to psychologists. *Aust Psychol* 2001;**36**:227–31. http://dx.doi.org/10.1080/00050060108259659

216. Franks P, Williams GC, Zwanziger J, Mooney C, Sorbero M. Why do physicians vary so widely in their referral rates? *J Gen Intern Med* 2000;**15**:163–8. http://dx.doi.org/10.1046/j.1525-1497.2000.04079.x

217. Espeland A, Baerheim A. Factors affecting general practitioners' decisions about plain radiography for back pain: implications for classification of guideline barriers – a qualitative study. *BMC Health Serv Res* 2003;**3**:8. http://dx.doi.org/10.1186/1472-6963-3-8

218. Cornford CS, Harley J, Oswald N. The '2-week rule' for suspected breast carcinoma: a qualitative study of the views of patients and professionals. *Br J Gen Pract* 2004;**54**:584–8.

219. Forrest CB, Nutting P, Werner JJ, Starfield B, von Schrader S, Rohde C. Managed health plan effects on the specialty referral process – results from the ambulatory sentinel practice network referral study. *Med Care* 2003;**41**:242–53. http://dx.doi.org/10.1097/01.MLR.0000044903.91168.B6

220. Green H, Johnston O, Cabrini S, Fornai G, Kendrick T. General practitioner attitudes towards referral of eating-disordered patients: a vignette study based on the theory of planned behaviour. *Ment Health Fam Med* 2008;**5**:213–18.

221. Young CE, Mutch AJ, Boyle FM, Dean JH. Investigating referral pathways from primary care to consumer health organisations. *Aust J Prim Health* 2010;**16**:260–7. http://dx.doi.org/10.1071/PY09081

222. Barnett ML, Keating NL, Christakis NA, O'Malley AJ, Landon BE. Reasons for choice of referral physician among primary care and specialist physicians. *J Gen Intern Med* 2012;**27**:506–12. http://dx.doi.org/10.1007/s11606-011-1861-z

223. Forrest CB, Nutting PA, Starfield B, von SS. Family physicians' referral decisions: results from the ASPN referral study. *J Fam Pract* 2002;**51**:215–22.

224. Dale N, Godsman J. Factors influencing general practitioner referrals to a tertiary paediatric neurodisability service. *Br J Gen Pract* 2000;**50**:131–2.

225. McKenna CF, Farber NJ, Eschbach KS, Collier VU. Primary care practitioners' understanding of psychiatric practice: effects on intention to refer. *Arch Phys Med Rehabil* 2005;**86**:881–8. http://dx.doi.org/10.1016/j.apmr.2004.09.014

226. Beel JV, Gringart E, Edwards MEE-MA, Beel JV. Western Australian general practitioners' views on psychologists and the determinants of patient referral: an exploratory study. *Families Systems Health* 2008;**26**:250–66. http://dx.doi.org/10.1037/a0012913

227. Wakefield P, Randall G, Fiala JM. Competing for referrals for cardiac diagnostic tests: what do family physicians really want? *JMIRS* 2012;**43**:155–60. http://dx.doi.org/10.1016/j.jmir.2012.04.001

228. Clemence ML, Seamark DA. GP referral for physiotherapy to musculoskeletal conditions – a qualitative study. *Fam Pract* 2003;**20**:578–82. http://dx.doi.org/10.1093/fampra/cmg515

229. Chew-Graham C, Slade M, Montâna C, Stewart M, Gask L. Loss of doctor-to-doctor communication: lessons from the reconfiguration of mental health services in England. *J Health Serv Res Policy* 2008;**13**:6–12. http://dx.doi.org/10.1258/jhsrp.2007.006053

230. Dagneaux I, Gillard I, De Lepeleire J. Care of elderly people by the general practitioner and the geriatrician in Belgium: a qualitative study of their relationship. *J Multidiscip Healthc* 2012;**5**:17–25. http://dx.doi.org/10.2147/JMDH.S27617

231. Harlan G, Srivastava R, Harrison L, McBride G, Maloney C. Paediatric hospitalists and primary care providers: a communication needs assessment. *J Hosp Med* 2009;**4**:187–93. http://dx.doi.org/10.1002/jhm.456

232. Allareddy V, Greene BR, Smith M, Haas M, Liao J. Facilitators and barriers to improving interprofessional referral relationships between primary care physicians and chiropractors. *J Ambulatory Care Manage* 2007;**30**:347–54. http://dx.doi.org/10.1097/01.JAC.0000290404.96907.e3

233. Taggarshe D, Haldipur N, Singh S. Generic outpatient referrals: why don't GPs make them? *J Public Health (Oxf)* 2006;**28**:218–20. http://dx.doi.org/10.1093/pubmed/fdl027

234. Samant RS, Fitzgibbon E, Meng J, Graham ID. Barriers to palliative radiotherapy referral: a Canadian perspective. *Acta Oncol* 2007;**46**:659–63. http://dx.doi.org/10.1080/02841860600979005

235. Xu T, Rohrer J, Borders T. The impact of managed care and practice size on primary care physicians' perceived ability to refer. *J Health Serv Res Policy* 2002;**7**:143–50. http://dx.doi.org/10.1258/135581902760082445

236. Massey J. Referral criteria to improve access for patients with incontinence/pelvic floor dysfunction from primary care to a physiotherapy continence service. *J Assoc Chartered Physiother Womens Health* 2004;**95**:29–35.

237. Berendsen AJ, Benneker WH, Meyboom-de JB, Klazinga NS, Schuling J. Motives and preferences of general practitioners for new collaboration models with medical specialists: a qualitative study. *BMC Health Serv Res* 2007;**7**:4. http://dx.doi.org/10.1186/1472-6963-7-4

238. Kinchen KS, Cooper LA, Levine D, Wang NY, Powe NR. Referral of patients to specialists: factors affecting choice of specialist by primary care physicians. *Ann Fam Med* 2004;**2**:245–52. http://dx.doi.org/10.1370/afm.68

239. Thorsen O, Hartveit M, Baerheim A. General practitioners' reflections on referring: an asymmetric or non-dialogical process? *Scand J Prim Health Care* 2012;**30**:241–6. http://dx.doi.org/10.3109/02813432.2012.711190

240. Greer RC, Powe NR, Jaar BG, Troll MU, Boulware LE. Effect of primary care physicians' use of estimated glomerular filtration rate on the timing of their subspecialty referral decisions. *BMC Nephrol* 2011;**12**:1. http://dx.doi.org/10.1186/1471-2369-12-1

241. Jiwa M, Arnet H, Bulsara M, Ee HC, Harwood A. What is the importance of the referral letter in the patient journey? A pilot survey in Western Australia. *Qual Prim Care* 2009;**17**:31–6.

242. Harvey NSG, Gill PV, Kimlim J. A survey of general practitioners' preferences, when referring to mental health services, and the implications for electronic outpatient booking. *Prim Care Community Psychiatry* 2005;**10**:51–6.

243. O'Byrne L, Darlow C, Roberts N, Wilson G, Partridge MR. Smoothing the passage of patients from primary care to specialist respiratory opinion. *Prim Care Respir J* 2010;**19**:248–53. http://dx.doi.org/10.4104/pcrj.2010.00028

244. Carlsen B, Aakvik A, Norheim OF. Variation in practice: a questionnaire survey of how congruence in attitudes between doctors and patients influences referral decisions. *Med Decis Making* 2008;**28**:262–8. http://dx.doi.org/10.1177/0272989X07311751

245. Johnson C, Paul C, Girgis A, Adams J, Currow D. Australian general practitioners' and oncology specialists' perceptions of barriers and facilitators of access to specialist palliative care services. *J Palliat Med* 2011;**14**:429–35. http://dx.doi.org/10.1089/jpm.2010.0259

246. Forrest CB, Shadmi E, Nutting PA, Starfield B. Specialty referral completion among primary care patients: results from the ASPN Referral Study. *Ann Fam Med* 2007;**5**:361–7. http://dx.doi.org/10.1370/afm.703

247. Ramchandani M, Mirza S, Sharma A, Kirkby G. Pooled cataract waiting lists: views of hospital consultants, general practitioners and patients. *J R Soc Med* 2003;**95**:598–600. http://dx.doi.org/10.1258/jrsm.95.12.598

248. Hyman I, Singh M, Ahmad F, Austin L, Meana M, George U, Wells LM, Stewart D. The role of physicians in mammography referral for older Caribbean women in Canada. *Medscape Womens Health* 2001;**6**:6.

249. Stavrou S, Cape J, Barker C. Decisions about referrals for psychological therapies: a matched-patient qualitative study. *Br J Gen Pract* 2009;**59**:e289–98. http://dx.doi.org/10.3399/bjgp09X454089

250. Vulto A, van Bommel M, Poortmans P, Lybeert M, Louwman M, Baart R, *et al.* General practitioners and referral for palliative radiotherapy: a population-based survey. *Radiother Oncol* 2009;**91**:267–70. http://dx.doi.org/10.1016/j.radonc.2009.01.009

251. Little P, Dorward M, Warner G, Stephens K, Senior J, Moore M. Importance of patient pressure and perceived pressure and perceived medical need for investigations, referral, and prescribing in primary care: nested observational study. *BMJ* 2004;**328**:444–46. http://dx.doi.org/10.1136/bmj.38013.644086.7C

252. Rosen R, Florin D, Hutt R. *An Anatomy of GP Referral Decisions: A Qualitative Study of GPs' Views on Their Role in Supporting Patient Care*. London: The King's Fund; 2007. URL: www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/anatomy-gp-referral-decisions-qualitative-study-patient-choice-rebecca-rosen-dominique-florin-ruth-hutt-kings-fund-29-january-2007.pdf (accessed 21 January 2014).

253. Blundell N, Clarke A, Mays N. Interpretations of referral appropriateness by senior health managers in five PCT areas in England: a qualitative investigation. *Qual Saf Health Care* 2010;**19**:182–6. http://dx.doi.org/10.1136/qshc.2007.025684

254. Glozier N, Prince M. Psychological determinants of primary care requests for urgent outpatient appointments in elective referrals. *J Eval Clin Pract* 2007;**13**:236–41. http://dx.doi.org/10.1111/j.1365-2753.2006.00685.x

255. Musila N, Underwood M, McCaskie AW, Black N, Clarke A, van der Meulen JH, *et al.* Referral recommendations for osteoarthritis of the knee incorporating patients' preferences. *Fam Pract* 2011;**28**:68–74. http://dx.doi.org/10.1093/fampra/cmq066

256. Davies E, van der Molen B, Cranston A, Davies E, van der Molen B, Cranston A. Using clinical audit, qualitative data from patients and feedback from general practitioners to decrease delay in the referral of suspected colorectal cancer. *J Eval Clin Pract* 2007;**13**:310–17. http://dx.doi.org/10.1111/j.1365-2753.2006.00820.x

257. Edwards M, BRIDGE Study Group. Responses of primary health care professionals to UK national guidelines on the management and referral of women with breast conditions. *J Eval Clin Pract* 2002;**8**:319–25. http://dx.doi.org/10.1046/j.1365-2753.2002.00335.x

258. Brien S, Howells E, Leydon G, Brien Ssacu. Why GPs refer patients to complementary medicine via the NHS: a qualitative exploration. *Prim Health Care Res Development* 2008;**9**:205–15. http://dx.doi.org/10.1017/S1463423608000789

259. Bekkelund SI, Salvesen R. Are headache patients who initiate their referral to a neurologist satisfied with the consultation? A population study of 927 patients – the North Norway Headace Study (NNHS). *Fam Pract* 2001;**18**:524–7. http://dx.doi.org/10.1093/fampra/18.5.524

260. Lewis CL, Wickstrom GC, Kolar MM, Keyserling TC, Bognar BA, Dupre CT, *et al.* Patient preferences for care by general internists and specialists in the ambulatory setting. *J Gen Intern Med* 2000;**15**:75–83. http://dx.doi.org/10.1046/j.1525-1497.2000.05089.x

261. Gross R, Tabenkin H, Brammli-Greenberg S. Who needs a gatekeeper? Patients' views of the role of the primary care physician. *Fam Pract* 2000;**17**:222–9. http://dx.doi.org/10.1093/fampra/17.3.222

262. Berendsen AJ, de Jong GM, Schuling J, Bosveld HE, de Waal MW, Mitchell GK, *et al.* Patient's need for choice and information across the interface between primary and secondary care: a survey. *Patient Educ Couns* 2010;**79**:100–5. http://dx.doi.org/10.1016/j.pec.2009.07.032

263. Shadd J, Ryan BL, Maddocks H, Thind A. Patterns of referral in a Canadian primary care electronic health record database: retrospective cross-sectional analysis. *Inform Prim Care* 2011;**19**:217–23.

264. Bertakis KD, Callahan EJ, Azari R, Robbins JA, Bertakis KD. Predictors of patient referrals by primary care residents to specialty care clinics. *Fam Med* 2001;**33**:203–9.

265. Dearman SP, Waheed W. Management strategies in geriatric depression by primary care physicians and factors associated with the use of psychiatric services: a naturalistic study. *Aging Ment Health* 2006;**10**:521–4. http://dx.doi.org/10.1080/13607860600637984

266. Ridsdale LC, Clark LV, Dowson AJ, Goldstein LH, Jenkins L, McCrone P, *et al.* How do patients referred to neurologists for headache differ from those managed in primary care? *Br J Gen Pract* 2007;**57**:388–95.

267. Cohen SM, Jaewhan K, Nelson R, Courey M. Factors influencing referral of patients with voice disorders from primary care to otolaryngology. *Laryngoscope* 2014;**124**:214–20. http://dx.doi.org/10.1002/lary.24280

268. Harris M, Jayasinghe U, Chan B. Patient and practice characteristics predict the frequency of general practice multidisciplinary referrals of patients with chronic diseases: a multilevel study. *Health Policy* 2011;**101**:140–5. http://dx.doi.org/10.1016/j.healthpol.2010.10.019

269. Vinker S, Kaiserman I, Karni A, Kitai E, Kasinetz LM, Elhayany A, *et al.* Urgent referrals to a specialist by family physicians – is the 'urgency' real: a prospective study. *Eur J Gen Pract* 2007;**13**:37–9. http://dx.doi.org/10.1080/13814780600881003

270. Albertson GA, Lin CT, Kutner J, Schilling LM, Anderson SN, Anderson RJ. Recognition of patient referral desires in an academic managed care plan. *J Gen Intern Med* 2000;**15**:242–7. http://dx.doi.org/10.1111/j.1525-1497.2000.02208.x

271. Johnson CE, Danhauer JL, Koch LL, Celani KE, Lopez IP, Williams VA, *et al.* Hearing and balance screening and referrals for Medicare patients: a national survey of primary care physicians. *J Am Acad Audiol* 2008;**19**:171–90. http://dx.doi.org/10.3766/jaaa.19.2.7

272. Hugo P, Kendrick T, Reid F, Lacey H. GP referral to an eating disorder service: why the wide variation? *Br J Gen Pract* 2000;**50**:380–3.

273. Bowling A, Harries C, Forrest D, Harvey N. Variations in cardiac interventions: doctors' practices and views. *Fam Pract* 2006;**23**:427–36. http://dx.doi.org/10.1093/fampra/cmi125

274. Balduf LM, Farrell TM. Attitudes, beliefs, and referral patterns of PCPs to bariatric surgeons. *J Surg Res* 2008;**144**:49–58. http://dx.doi.org/10.1016/j.jss.2007.01.038

275. Chan BT, Austin PC. Patient, physician, and community factors affecting referrals to specialists in Ontario, Canada: a population-based, multi-level modelling approach. *Med Care* 2003;**41**:500–11. http://dx.doi.org/10.1097/01.MLR.0000053971.89707.97

276. Bolaños-Carmona V, Ocaña-Riola R, Prados-Torres A, Gutiérrez-Cuadra P. Variations in health services utilisation by primary care patients. *Health Serv Manage Res* 2002;**15**:116–25. http://dx.doi.org/10.1258/0951484021912888

277. Ache KA, Shannon RP, Heckman MG, Diehl NN, Willis FB, Ache KA, *et al.* A preliminary study comparing attitudes towards hospice referral between African American and white American primary care physicians. *J Palliat Med* 2011;**14**:542–7. http://dx.doi.org/10.1089/jpm.2010.0426

278. Navaneethan SD, Kandula P, Jeevanantham V, Nally JV Jr, Liebman SE, Navaneethan SD, *et al.* Referral patterns of primary care physicians for chronic kidney disease in general population and geriatric patients. *Clin Nephrol* 2010;**73**:260–7. http://dx.doi.org/10.5414/CNP73260

279. Cooper SM, Wojnarowska F. The influence of the sex of the general practitioner on referral to a vulval clinic. *Journal Obstet Gynaecol* 2001;**21**:179–80. http://dx.doi.org/10.1080/01443610020026155

280. Coyle E, Hanley K, Sheerin J. Who goes where? A prospective study of referral patterns within a newly established primary care team. *Ir J Med Sci* 2011;**180**:845–9. http://dx.doi.org/10.1007/s11845-011-0724-2

281. Gruen RL, Knox S, Britt H. Where there is no surgeon: the effect of specialist proximity on general practitioners' referral rates. *Med J Aust* 2002;**177**:111–15.

282. Feeney E, Noble H, Waller G. Referral patterns to a specialist eating disorder service: the impact of the referrer's gender. *Eur Eat Disord Rev* 2007;**15**:45–9. http://dx.doi.org/10.1002/erv.759

283. Forrest CB, Nutting PA, von SS, Rohde C, Starfield B. Primary care physician specialty referral decision making: patient, physician, and health care system determinants. *Med Decis Making* 2006;**26**:76–85. http://dx.doi.org/10.1177/0272989X05284110

284. Chauhan M, Bankart MJ, Labeit A, Baker R. Characteristics of general practices associated with numbers of elective admissions. *J Public Health* 2012;**34**:584–90. http://dx.doi.org/10.1093/pubmed/fds024

285. Sullivan CO, Omar RZ, Ambler G, Majeed A. Case-mix and variation in specialist referrals in general practice. *Br J Gen Pract* 2005;**55**:529–33.

286. Chen FM, Fryer GE Jr, Norris TE. Effects of comorbidity and clustering upon referrals in primary care. *J Am Board Fam Pract* 2005;**18**:449–52. http://dx.doi.org/10.3122/jabfm.18.6.449

287. McBride D, Hardoon S, Walters K, Gilmour S, Raine R. Explaining variation in referral from primary to secondary care: cohort study. *BMJ* 2010;**341**:c6267. http://dx.doi.org/10.1136/bmj.c6267

288. Robinson PC, Taylor WJ. Time to treatment in rheumatoid arthritis: factors associated with time to treatment initiation and urgent triage assessment of general practitioner referrals. *J Clin Rheumatol* 2010;**16**:267–73. http://dx.doi.org/10.1097/RHU.0b013e3181eeb499

289. Johnson CE, Girgis A, Paul CL, Currow DC. Palliative care referral practices and perceptions: the divide between metropolitan and non-metropolitan general practitioners. *Palliat Support Care* 2011;**9**:181–9. http://dx.doi.org/10.1017/S1478951511000058

290. Guevara JP, Greenbaum PE, Shera D, Bauer L, Schwarz DF. Survey of mental health consultation and referral among primary care pediatricians. *Acad Pediatr* 2009;**9**:123–7. http://dx.doi.org/10.1016/j.acap.2008.12.008

291. Bowling A, Redfern J. The process of outpatient referral and care: the experiences and views of patients, their general practitioners, and specialists. *Br J Gen Pract* 2000;**50**:116–20.

292. Grace SL, Grewal K, Stewart DE. Factors affecting cardiac rehabilitation referral by physician specialty. *J Cardiopulm Rehab Prev* 2008;**28**:248–52. http://dx.doi.org/10.1097/01.HCR.0000327182.13875.07

293. Holley CD, Lee PP. Primary care provider views of the current referral-to-eye-care process: focus group results. *Invest Ophthalmol Vis Sci* 2010;**51**:1866–72. http://dx.doi.org/10.1167/iovs.09-4512

294. Kier A, George M, McCarthy P. Referral patterns to spinal manipulative therapy by Welsh general practitioners. *Clinical Chiropractic* 2012;**15**:91–2. http://dx.doi.org/10.1016/j.clch.2012.06.015

295. Todman JP, Law J, MacDougall A. Attitudes of GPs towards Older Adults Psychology Services in the Scottish Highlands. *Rural Remote Health* 2011;**11**:1496.

296. Soomro GM, Burns T, Majeed A. Socio-economic deprivation and psychiatric referral and admission rates: an ecological study in one London borough. *Psychiatr Bull* 2002;**26**. http://dx.doi.org/10.1192/pb.26.5.175

297. Mulvaney C, Coupland C, Wilson A, Hammersley V, Dyas J, Carlisle R, *et al.* Does increased use of private health care reduce the demand for NHS care? A prospective survey of general practice referrals. *J Public Health (Oxf)* 2005;**27**:182–8. http://dx.doi.org/10.1093/pubmed/fdi013

298. Soerensen TH, Olsen KR, Vedsted P. Association between general practice referral rates and patients' socioeconomic status and access to specialised health care: a population-based nationwide study. *Health Policy* 2009;**92**:180–6. http://dx.doi.org/10.1016/j.healthpol.2009.03.011

299. Malcolm JC, Liddy C, Rowan M, Maranger J, Keely E, Harrison C, *et al.* Transition of patients with type 2 diabetes from specialist to primary care: a survey of primary care physicians on the usefulness of tools for transition. *Can J Diabetes* 2008;**32**:37–45. http://dx.doi.org/10.1016/S1499-2671(08)21009-9

300. Walders N, Childs GE, Comer D, Kelleher KJ, Drotar D, Walders N, *et al.* Barriers to mental health referral from pediatric primary care settings. *Am J Manag Care* 2003;**9**:677–83.

301. Burns T. Socio-economic deprivation and psychiatric referral and admission rates: an ecological study in one London borough. *Psychiatr Bull* 2002;**26**:175–8. http://dx.doi.org/10.1192/pb.26.5.175

302. Love T, Crampton P, Salmond C, Dowell A. Patterns of medical practice variation: variability in referral for back pain by New Zealand general practitioners. *N Z Med J* 2005;**118**:U1381.

303. Ashworth M, Clement S, Sandhu J, Farley N, Ramsay R, Davies T, *et al.* Psychiatric referral rates and the influence of on-site mental health workers in general practice. *Br J Gen Pract* 2002;**52**:39–41.

304. Boulware LE, Troll MU, Jaar BG, Myers DI, Powe NR. Identification and referral of patients with progressive CKD: a national study. *Am J Kidney Dis* 2006;**48**:192–204. http://dx.doi.org/10.1053/j.ajkd.2006.04.073

305. Chung K, Yang D, Lee JH. Determinants of primary care physicians' referral pattern: a structural equation model approach. *Int J Public Pol* 2010;**5**:259–71. http://dx.doi.org/10.1504/IJPP.2010.030607

306. Greenaway R, Fortune L. General practitioners' views of psychology services: a comparison of general practitioners who refer to onsite and offsite services. *Prim Care Ment Health* 2006;**4**:245–54.

307. Franz CE, Barker JC, Kim K, Flores Y, Jenkins C, Kravitz RL, *et al.* When help becomes a hindrance: mental health referral systems as barriers to care for primary care physicians treating patients with Alzheimer's disease. *Am J Geriatr Psychiatry* 2010;**18**:576–85. http://dx.doi.org/10.1097/JGP.0b013e3181a76df7

308. Alexander C, Fraser J. General practitioners' management of patients with mental health conditions: the views of general practitioners working in rural north-western New South Wales. *Aust J Rural Health* 2008;**16**:363–9. http://dx.doi.org/10.1111/j.1440-1584.2008.01017.x

309. Patton M. *Qualitative Research and Evaluation Methods*. 3rd edn. Thousand Oaks, CA: Sage; 2002.

310. Anderson R, Crabtree B, Steele D, McDaniel R. Case study research: the view from complexity science. *Qual Health Res* 2005;**15**:669–85. http://dx.doi.org/10.1177/1049732305275208

311. Capra F. *The Web of Life*. New York, NY: Anchor-Doubleday; 1996.

312. Alvarez MP, Agra Y. Systematic review of educational interventions in palliative care for primary care physicians. *Palliat Med* 2006;**20**:673–83. http://dx.doi.org/10.1177/0269216306071794

313. Bazian Ltd. Specialist outreach into primary care: is it better than standard care? *Evid-Based Healthc Public Health* 2005;**9**:294–301.

314. Bower P, Sibbald B. Systematic review of the effect of on-site mental health professionals on the clinical behaviour of general practitioners. *BMJ* 2000;**320**:614–17. http://dx.doi.org/10.1136/bmj.320.7235.614

315. Bower P, Sibbald B. Do consultation-liaison services change the behaviour of primary care providers? A review. *General Hospital Psychiatry* 2000;**22**:84–96. http://dx.doi.org/10.1016/S0163-8343(00)00058-X

316. Brocklehurst PR, Baker SR, Speight PM. Primary care clinicians and the detection and referral of potentially malignant disorders in the mouth: a summary of the current evidence. *Prim Dent Care* 2010;**17**:65–71. http://dx.doi.org/10.1308/135576110791013749

317. Cardiff University, CRG Research Ltd. *Evaluation of Referral Management Pilots in Wales*. NHS Wales and National Leadership and Innovation Agency for Healthcare; 2006.

318. CRG Research Ltd, Cardiff University. *Referral Management Pilots in Wales – Follow Up Review*. National Leadership and Innovation Agency for Healthcare; 2007.

319. Clarke A, Blundell N, Forde I, Musila N, Spitzer D, Naqvi S, *et al.* Can guidelines improve referral to elective surgical specialties for adults: a systematic review. *Qual Saf Health Care* 2008;**19**:187–94. http://dx.doi.org/10.1136/qshc.2008.029918

320. Delva F, Soubeyran P, Rainfray M, Mathoulin-Pelissier S. Referral of elderly cancer patients to specialists: action proposals for general practitioners. *Cancer Treatment Reviews* 2012;**38**:935–41. http://dx.doi.org/10.1016/j.ctrv.2012.03.010

321. Foot C, Naylor C, Imison C. *The Quality of GP Diagnosis and Referral*. London: The King's Fund; 2010.

322. Forrest CB. Primary care gatekeeping and referrals: effective filter of failed experiment? *BMJ* 2003;**326**:692–5. http://dx.doi.org/10.1136/bmj.326.7391.692

323. Gruen RL, Weeramanthri TS, Knight SS, Bailie RS. Specialist outreach clinics in primary care and rural hospital settings. *Cochrane Database Syst Rev* 2003;**4**:CD003798. http://dx.doi.org/10.1002/14651858.CD003798.pub2

324. Harkness EF, Bower PJ. On site mental health workers delivering psychological therapy and psychosocial interventions to patients in primary care: effects on the professional practice of primary care providers. *Cochrane Database Syst Rev* 2009;**1**:CD000532. http://dx.doi.org/10.1002/14651858.CD000532.pub2

325. Herrington P, Baker R, Gibson SL, Golden S. GP referrals for counselling: a review and model. *J Interprof Care* 2003;**17**:263–71. http://dx.doi.org/10.1080/1356182031000122889

326. Jiwa M, Dadich A. Referral letter content: can it affect patient outcomes? *Br J Health Care Manage* 2013;**19**:140–7. http://dx.doi.org/10.12968/bjhc.2013.19.3.140

327. Lin CY. Improving care coordination in the specialty referral process between primary and specialty care. *N C Med J* 2012;**73**:61–2.

328. Martin A, Macleod C, Naqui SAR. *Effectiveness and Cost-Effectiveness of Targeted Interventions to Reduce Unnecessary Referrals and Improve the Quality of Referrals from Primary Care to Secondary Care*. NHS Evidence Adoption Centre East of England; 2010.

329. Mead N, Bower P. Patient centred consultations and outcomes in primary care: a review of the literature. *Patient Educ Couns* 2002;**48**:51–61. http://dx.doi.org/10.1016/S0738-3991(02)00099-X

330. Mehrota A, Forrest CB, Lin CY. Dropping the baton: specialty referrals in the United States. *Millbank Q* 2011;**89**:39–68. http://dx.doi.org/10.1111/j.1468-0009.2011.00619.x

331. Navaneethan SD, Aloudat S, Singh S. A systematic review of patient and health system characteristics associated with late referral in chronic kidney disease. *BMC Nephrology* 2008;**9**. http://dx.doi.org/10.1186/1471-2369-9-3

332. O'Donnell CA. Variation in GP referral rates: what can we learn from the literature? *Fam Pract* 2000;**17**:462–71. http://dx.doi.org/10.1093/fampra/17.6.462

333. Piterman L, Koritsas S. Part II General practitioner-specialist referral process. *Intern Med J* 2005;**35**:491–6. http://dx.doi.org/10.1111/j.1445-5994.2005.00860.x

334. Powell J. Systematic review of outreach clinics in primary care in the UK. *J Health Serv Res Policy* 2007;**7**:177–83. http://dx.doi.org/10.1258/135581902760082490

335. Qureshi NA, van der Molen HT, Schmidt HG, Al-Habeeb TA, Magzoub MEM. Criteria for a good referral system for psychiatric patients: the view from Saudi Arabia. *Eastern Mediterr Health J* 2009;**15**:1580–95.

336. Roland M, McDonald R, Sibbald B, Boyd A, Fotaki M, Gravelle H, *et al. Outpatient Services and Primary Care: A Scoping Review of Research into Strategies for Improving Outpatient Effectiveness and Efficiency*. National Primary Care Research and Development Centre, and Centre for Public Policy and Management of the University of Manchester; 2006.

Appendix 1 Extraction tables

Intervention papers

Adams 2012[33] Country: USA Study design: Before-and-after Data collection method: Audience response system Aim: To describe the development and implementation process and assess the effect on self-reported clinical practice changes of a multidisciplinary, collaborative, interactive CME/ continuing education (CE) programme on COPD Detail of participants (number, any reported demographics): 351 participants	Method: Multidisciplinary subject matter experts and education specialists used a systematic instructional design approach and collaborated with the American College of Chest Physicians and American Academy of Nurse Practitioners to develop, deliver and reproduce a 1-day interactive COPD CME/CE program for 351 primary-care clinicians in 20 US cities from 23 September 2009 to 13 November 2010 Control: NA Length of follow-up: 3- to 6-month follow-up survey Response and/or attrition rate: 132 of 271 participants (48.7%) Context (from what/who to what/who): GP referral for COPD	Outcome measures: Self-confidence Knowledge and comprehension	Main results: Clinician self-confidence improved after the course in all areas measured. In addition, clinician knowledge/ comprehension significantly improved [mean (SD) pre-test percentage correct, 77.1% (16.4); 95% CI 76.2% to 78.9%; and mean (SD) post-test percentage correct, 94.7% (8.7%); 95% CI 94.2% to 95.2%; $p < 0.001$], with an absolute percentage change of 17.6% (13.2%) Of the five knowledge (recall) questions, the mean (SD) improvement in pre-test vs. post-test scores was 14% (5.0%) (95% CI 9.6% to 18.4%), from 83.1% to 97.1% ($p < 0.001$). The mean improvement in the five comprehension/ application questions was 2.7% 17.5% (95% CI 7.4% to 38.0%), from 68.8% to 91.5% ($p < 0.001$) Of the follow-up survey respondents, 92 of 132 (69.7%) reported completely implementing at least one clinical practice change, and only 8 of 132 (6.1%) reported inability to make any clinical practice change after the programme	Reported associations between elements for logic model: A carefully designed, interactive, flexible, dynamic, and reproducible COPD CME/CE programme tailored to clinicians' needs that involves diverse instructional strategies and media can have short-term and long-term improvements in clinician self-confidence, knowledge/comprehension, and clinical practice

Akbari 2012[110] Country: Canada Study design: Before-and-after Data collection method Aim: To show whether or not automatic reporting of the eGFR, along with an ad hoc educational component for primary care physicians, would increase the number of appropriate referrals Detail of participants (number, any reported demographics): All referrals to nephrologists received at the centre during the year before and the year after automatic reporting of the eGFR was introduced were included. The area served by the Champlain Local Health Integration Network has a population of 1,176,600, of whom 12.5% are 65 years or older, 17% are immigrants and 13% are from visible minorities	Method: Automatic reporting of eGFR to inform referral decision Concurrent with the introduction of automatic reporting of the eGFR, the nephrology service mailed an algorithm to all primary care physicians in the Champlain Local Health Integration Network. This algorithm explained the interpretation of the eGFR and appropriate parameters for referrals to nephrology, based on the value. In addition, ad hoc educational sessions (lectures and workshops) were provided to the primary care physicians to discuss interpretation of the eGFR results and parameters for referral to nephrology Control: None Length of follow-up: 1 year Response and/or attrition rate: NR Context (from what/who to what/who): GP to nephrologist	Outcome measures: Number and appropriateness of referrals to nephrologists	Main results: A total of 2672 patients were included in the study. In the year after automatic reporting began, the number of referrals from primary care physicians increased by 80.6% (95% CI 74.8% to 86.9%) The number of appropriate referrals increased by 43.2% (95% CI 38.0% to 48.2%) There was no significant change in the proportion of appropriate referrals between the two periods (–2.8%, 95% CI –26.4% to 43.4%) In the year after automatic reporting of the eGFR was introduced, the total number of referrals increased significantly among patients 80 years and older (percentage-point change 8.0; $p < 0.001$) and among women (percentage-point change 12.6; $p < 0.001$)	Reported associations between elements for logic model: The total number of referrals increased after automatic reporting of the eGFR began, especially among women and elderly people The number of appropriate referrals also increased, but the proportion of appropriate referrals did not change significantly

Albertson 2002[158] Country: USA Study design: Sequential prospective study before-and-after Data collection method: Questionnaire Aim: To determine whether or not a brief pre-visit questionnaire about referral concerns can improve primary care provider recognition of patient concerns and satisfaction with care Detail of participants (number, any reported demographics): 12 PCP, 1495 patients	Intervention: Patients were given a pre-visit questionnaire about referral need and rationale and a post-visit questionnaire about referral concern and visit satisfaction. Providers were given a post-visit questionnaire asking whether a referral was discussed, or made, and about visit satisfaction. In the control phase patient pre-visit questionnaires remained confidential, whereas in the intervention phase PCPs were shown the pre-visit questionnaire at the time of the encounter Control: As above Length of follow-up: None Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to specialist	Outcome measures: Referral Satisfaction	Main results: The intervention significantly increased PCP referral recognition from 61% to 81% ($p < 0.001$) and was associated with increased visit satisfaction ($p = 0.05$). Satisfaction of PCPs with the referral discussion, overall rate of referral, and visit duration were not affected by the intervention	Reported associations between elements for logic model:
Banait 2003[53] Country: UK Study design: Cluster RCT Data collection method: NR Aim: To test the effectiveness of educational outreach as a strategy for facilitating the uptake of dyspepsia management guidelines in primary care Detail of participants (number, any reported demographics): 114 general practices (233 GPs) in Salford and Trafford	Method: All groups received the guidelines by post. The intervention groups began to receive education outreach 3 months later Including: Practice-based seminars with hospital specialists at which guidelines recommendations were appraised and implementation plans formulated, reinforcement visits after 12 weeks Control: Guidelines received by post Length of follow-up: 6 months post intervention Response and/or attrition rate: One practice dropped out Context (from what/who to what/who): GP to open-access endocscopy (GI)	Outcome measures: Appropriateness of referral for open-access endoscopy	Main results: The proportion of appropriate referrals was higher in the intervention group in the 6 months' post-intervention period (practice medians: control = 50%, intervention = 63.9%; $p < 0.05$) The proportion of major findings at endoscopy did not alter significantly, but there was an overall rise in acid suppressing drugs in the intervention group, compared with the control group (+ 8% vs. + 2%, $p = 0.005$)	Reported associations between elements for logic model: Outreach may be more effective that passive guideline dissemination in changing clinical behaviour, but unexpected outcomes may emerge (increased drug prescription)

Bennett 2001[30] Country: UK Study design: cRCT Data collection method: Routine data on ENT referrals and diagnostic results Aim: To evaluate the effect of a risk factor checklist and training video for GPs in reducing inter-practice variation and improving the appropriateness of referrals Detail of participants (number, any reported demographics): 50 practices (177 GPs) from NHS Trent and West Scotland	Intervention: Practices were cluster randomised to either the control group ($n = 12$) or to one of three intervention groups (training video $n = 16$, checklist $n = 11$, or both $n = 11$) Data on all paediatric ENT referrals and diagnostic results were collected for 1 year pre and post intervention. Referral rates for otitis media with effusion (glue ear) and for closely related conditions were calculated for children aged 0–15 years based on practice size. Positive predictive value was defined as the proportion of referrals resulting in bilateral hearing loss of > 20 dB at the ENT outpatient department Number of hours: NA Delivered by who? NA Control: No intervention Length of follow-up: 1 year Response and/or attrition rate: NR Context (from what/who to what/who): GP referral to ENT for glue ear	Outcome measures: Appropriateness of referrals Variation in referral rate	Main results: There was significant improvement in the positive predictive value, adjusted for patient waiting time between GP referral and appointment at the ENT department. The improvement in positive predictive value pre and post intervention was 15% (95% CI –12.1% to 41.7%) for the practices receiving both interventions, compared with 20% (95% CI –32.9 to –6.4%) for practices receiving only one intervention and a degradation of 34% for those receiving no intervention	Reported associations between elements for logic model: Disseminating a risk factor checklist and training video improved quality of ENT referral for glue ear by more than administering only one of these interventions

Bhalla 2002[37] Country: UK Study design: Case control Data collection method: Annual otolaryngology referral rates from individuals in two demographically matched general practices to the two ENT consultants were gathered prospectively over a 6-year time period Aim: To determine if the provision of clinical ENT training to a GP influenced the subsequent rates of referral to specialist clinics, and if the presence of this practitioner within the practice made any difference to overall referrals by other partners	Intervention: One partner, within practice A, attended three or four clinical ENT sessions over a 2-week period, once a year for 3 years, where he would work alongside the consultant otolaryngologist Number of hours: Three or four clinical ENT sessions over a 2-week period, once a year for 3 years Delivered by who? Consultant otolaryngologist Control: Second practice with no training intervention Length of follow-up: 3 years. Data gathered over 6-year period Response and/or attrition rate: NA Context (from what/who to what/who): Referral from general practice to otolaryngology (ENT)	Outcome measures: Referral rates	Main results: There was no statistical difference in referral rates (Kruskal–Wallis: $p = 0.63$) for the trained partner when compared with the other three partners in the same practice No statistical difference in referral patterns between the intervention and the control practice (Mann–Whitney *U*-test: $p = 0.50$) Intervention practice 552 referrals over 6 years, control practice 521 referrals. No difference in each year either Sharp increase in number of referrals from both practices in third year of data collection	Reported associations between elements for logic model: The presence of a partner in receipt of continued ENT training made no difference to the specialist referral rates over a 6-year period when compared with the other partners within the same general practice. Furthermore, the presence of this partner did not influence the number of referrals from the practice as a whole when compared with a demographically matched general practice

Detail of participants (number, any reported demographics): Two demographically twinned practices of similar size (demographics not reported). Intervention practice had four partners (no other details)

TABLE I: Numbers of ENT referrals for individual partners within the same practice

Year	DU	JS	ML	ST
1994–5	4	2	4	6
1995–6	15	10	14	8
1996–7	40	36	22	39
1997–8	38	33	37	31
1998–9	33	22	27	32
1999–2000	26	19	28	26
Total	156	122	132	142

There was also no statistical difference (Mann–Whitney *U*-test: $p = 0.50$) in the referral patterns between the two practices

TABLE II: Numbers of ENT referrals from all partners within two demographically matched general practices

Year	Practice A	Practice B
1994–5	16	21
1995–6	47	38
1996–7	137	119
1997–8	139	142
1998–9	114	90
1999–2000	99	111

Bridgman 2005[70] Country: UK Study design: Controlled before-and-after Data collection method: Routine data Aim: To evaluate a slot system Detail of participants (number, any reported demographics): General practices in Staffordshire – 12 intervention, 24 controls, 63 others. Intervention group – mix of practices in area to include large and small, urban and rural, and champions and likely critics. Practices represented 14% of population, size varied from 17,000 to 14,000 and from one to six partners. 33 GPs involved, 30 full-time, three single handed and one job-share, one practice a training practice. Eleven practices were average referrers and one was a high referrer	Intervention: System developed by MD input. GPs and orthopaedic consultants invited to a meeting to discuss and input to design. Postal survey to GPs regarding need and views Number of slots available based on registered practice population. Not adjusted for age. Quota of slots and their use fed back to practice on monthly basis. If they went beyond their quota they might not be allowed to refer any more patients that month. GPs guaranteed maximum of 8-week assessment for patients and backlog of waiting patients removed. GPs received guidelines on appropriate referrals and routes of referrals for musculoskeletal problems Clerical officer appointed to answer queries, make appointments. Modification to hospital software; referrals made using a special pro forma, which included a prioritisation score. New referrals triaged to most appropriate clinic by clinical director Number of hours: NA Delivered by who? NA Control: 24 control practices and all other practices in area (631) Length of follow-up: Up to second half of second year Response and/or attrition rate: All selected practices agreed to participate Context (from what/who to what/who): GP to orthopaedic outpatient clinic	Outcome measures: Difference in referral rates per 10,000 population per month by practice	Main results: 15,439 referrals made, 90% attended appointments Mean monthly referral rate in the intervention group declined 22% in year 1 and was maintained in year 2. From baseline to intervention year 1 [9.4 (SE 0.41) to 7.29 (SE 0.31) and in intervention year 2 [7.31 (SE 0.21)] Rates for two non-intervention groups were stable/slight decrease in year 1 [baseline 10.99 (SE 0.52) and 9.50 (SE 0.29) to year 1 9.9 (SE 0.39) and 9.31 (SE 0.36). Referrals increased in year 2 [11.7 (SE 0.48) and 10.33 (SE 0.36)] Difference in mean referral rate control to intervention = –1.59 intervention, –2.61 control, –4.39 other comparator Relative mean rate in reductions in mean referral rates were 14.5%, –23.7% and –39.5% in period 0, year 1 and year 2, respectively Linear regression indicated that the interaction between practice group and the time period was statistically significant (not reported)	Reported associations between elements for logic model: A slot system can reduce referrals

Callaway and Frisch 2000[121] Country: USA Study design: Service data review Data collection method: Clinic log review Aim: To evaluate whether LEEP training for family physicians impacts on referral to gynaecology Detail of participants (number, any reported demographics): $n = 272$ women attending a cervical dysplasia clinic	Intervention: LEEP for cervical dysplasia carried out by family physicians in a cervical dysplasia clinic Number of hours: NA Delivered by who? Family physicians Control: None Length of follow-up: Evaluation over 6 years Response and/or attrition rate: NA Context (from what/who to what/who): Family physician to gynaecologist	Outcome measures: Number of women referred to gynaecology	Main results: During the study period, 283 women were seen in the clinic, and 26 individuals (9%) were referred by the family physician colposcopist to a consulting gynaecologist Of the 9% referred to gynaecologist, all but one subsequently treated with laser or combination of laser and LEEP	Reported associations between elements for logic model: Family physicians who are well-trained in LEEP can manage cases without referral Physicians need to be thoroughly trained in cognitive and technical aspects of electrosurgery (and presumably have necessary equipment)
Campbell 2003[131] Country: UK Study design: Cluster RCT Data collection method: Referral data Aim: To gather referral data as part of RCT evaluating specialist outreach clinics Detail of participants (number, any reported demographics): 203 GP practices in SE Scotland Women with a positive family history of breast cancer	Intervention: Referral to a clinic held in community setting near to the GP practice Number of hours: NA Delivered by who? NA Control: Existing service – an appointment to see a consultant geneticist and breast surgeon at a regional centre Length of follow-up: NA Response and/or attrition rate: 84% of practices agreed to take part Context (from what/who to what/who): GPs to cancer genetics advisors	Outcome measures: Referral rates before and during the trial	Main results: The referral rate rose from 2 years before the trial to during the trial (0.21 to 0.31). A 48% increase in referral rate ($p < 0.001$) 43% of women asked to be referred. Younger women were more likely to have taken the initiative to request referral ($p = 0.001$ chi-squared). Substantially greater increase in referral rates to community clinics than to regional centre (64% increase vs. 38% increase), suggesting that providing a service in the community resulted in a change in GP referral behaviour. This was particularly apparent in practices in relatively deprived communities. Higher referral rates from practices with more female partners before and during the trial ($p < 0.005$ and $p < 0.02$)	Reported associations between elements for logic model: Provision of specialist service in community Sex of referrer

Chen 2010[100] Country: USA Study design: Before-and-after Data collection method: Clinical data Aim: To evaluate a new consultation request process, called e-Referral Detail of participants (number, any reported demographics): Primary care clinicians practising in five hospital-based, 11 community-based, and 10 independent non-profit community clinics in San Francisco San Francisco General Hospital, which provides more than 500,000 outpatient visits annually	Intervention: A new consultation request process, called e-Referral, was integrated into the hospital's electronic health record. Clinician reviewers screen requests to evaluate urgency, choice of specialties, whether or not sufficient work-up information is provided, and whether or not a specialist needs to see the patient or can guide the primary care clinician through the e-Referral system Control: None Length of follow-up: NR Response and/or attrition rate: NR Context (from what/who to what/who): GP referral to secondary care	Outcome measures: Waiting times Appropriate referrals	Main results: Waiting times for non-urgent visits declined in seven of eight medical specialty clinics by up to 90% during the first 6 months of use. Expedited visits accounted for up to one-third of all visits in some specialties. The percentage of referrals deemed inappropriate by medical and surgical specialists was cut by more than half For clinics that had been plagued by long wait times, implementation of e-Referral resulted in dramatic improvements. For example, in rheumatology, the median wait time for a non-urgent appointment initially dropped from 126 days to 29 days Access to a common electronic health record and participation by specialists who are salaried, and thus not financially dependent on generating visits, were critical to this programme's success, but generally neither is an option in most practice settings. Success also depends on how well reviewers interact with primary care clinicians. The majority of primary care clinicians reported that e-Referral improved patient care, but those with poorer access to the electronic health record found it more time-consuming than the previous paper-based system	Reported associations between elements for logic model: The percentage of referrals deemed inappropriate by medical and surgical specialists was cut by more than half

Cooper 2012[19] Country: UK Study design: Evaluation/audit report Data collection method: NR Aim: To identify the underlying drivers for variance in referral rate and make plans to address them Detail of participants (number, any reported demographics): Not clear	Intervention: Peer review scheme for referrals. Two guiding principles – the review would benefit the practice and the commissioning group; there was no blame GPs, nurses, advanced health-care practitioners and practice managers attended a workshop event. Each practice bought two or three trauma and orthopaedic referral letters. Participants worked at mixed tables to understand each practice's referral profile, and share how each practice would handle each situation. Then to identify any gaps or areas of changed needed in terms of: Information needs Training needs Commissioning needs Needs for guidelines This led to a joint health training programme and individual practices were encouraged to tackle specialties where they were outliers Number of hours: Unclear Delivered by who? Unclear Control: None Length of follow-up: NR Response and/or attrition rate: NA Context (from what/who to what/who): GP referrals to trauma/ orthopaedics and any specialty	Outcome measures: Achieving target referral levels (incentivised) Target calculated by working out average rate per 1000 of weighted captitation for all GP referrals. Practices were awarded 20p per registered patient for referring below that level	Main results: Trauma and orthopaedic expenditure in 2010–11 was 17% lower than in 2006–7 when the first workshop was conducted. One practice cut ENT referrals by 20% in the first year and 40% overall	Reported associations between elements for logic model: Using clear communication and a professional approach can lead doctors to accept that peer review in not a 'blame game' but an opportunity to share and build experience In this context peer review can have a positive effect in reducing referral rates

Cox 2013[156] Country: UK Study design: Retrospective before-and-after Data collection method: Internal peer review of referral data Aim: To establish whether or not the introduction of referral management centres was associated with a reduction in hospital outpatient attendance rates Detail of participants (number, any reported demographics): 376,000 outpatient attendances from 85 practices	Method: 85 practices formed five groups to manage referrals. Two groups also carried out peer review of referrals The directly age standardised GP referred first outpatient monthly attendance rate was calculated for each group from April 2009 to March 2012 using 5-year age bands. Linear regression tested for association between the introduction of referral management and change in outpatient attendance rate The RM interventions were more complex than internal peer-review interventions, involved a wider range of activities and including activities not directly related to referral management (no info given) Control: None Length of follow-up: Unclear. Study 3 years Response and/or attrition rate: NA Context (from what/who to what/who): GP to hospital outpatients	Outcome measures: Attendance rate	Main results: Four groups showed statistically significant increases in attendance rates ranging from 0.41 to 1.20 attendances per 1000 persons per month After correction, only one group (3, referral management centre) remained significant (1.05 attendances per 1000 persons per month, 95% CI 0.64 to 1.64; $p < 0.005$) There were no decreases in attendance rate	Reported associations between elements for logic model: The introduction of referral management centres was not associated with a reduction in hospital attendance rates in any group

Cusack and Buckley 2005[43] Country: UK Study design: Before-and-after Data collection method: Examination of referral letter quality Aim: To investigate the impact of issuing guidelines on acne referral Detail of participants (number, any reported demographics): 90 referral letters from GPs prior to guidelines and 60 following guideline introduction. 36 GPs	Intervention: Guidelines and pro forma for future referrals sent to GPs Number of hours: NA Control: None Length of follow-up: 18 months Response and/or attrition rate: NA Context (from what/who to what/who): GP to dermatology	Outcome measures: Number of referrals	Main results: The number of referrals in accordance with NICE guidelines increased from 31% to 45% after introduction of guidelines ($p = 0.041$). The number of inappropriate referrals decreased from 69% to 55% 22% of GPs (8 of 36) fully complied with guidelines. Over 50% of referrals still inappropriate. Pro forma used in only 23% of referrals and provision of data in referral letters remained poor. Number of referrals per month only marginally decreased	Reported associations between elements for logic model: Guideline provision and limited impact on referral
DAMASK 2008[76] Country: UK Study design: Cost-effectiveness analysis alongside RCT Data collection method: Costs estimated in terms of QALYs, patient responses to EQ-5D questionnaire Aim: To investigate cost-effectiveness of GP referral to early MRI scan Detail of participants (number, any reported demographics): $n = 386$ patients consulting GP about a knee problem	Intervention: Referral from GP to local radiology department for MRI. Early access to imaging Number of hours: NA Delivered by who? NA Control: Normal care – referral to local orthopaedic department Length of follow up: NA Response and/or attrition rate: Data available for 70% (386) of sample Context (from what/who to what/who): GP to MRI (knee problems)	Outcome measures: QALYs Cost Health outcomes Knee-related NHS usage reported by patients	Main results: Early MRI was associated with higher NHS cost by £294 per patient and a larger number of QALYs by 0.05. Incremental cost per QALY gained of £5840 was below cost threshold of £20,000 per QALY commonly used in the NHS; therefore, is cost-effective use of NHS resources Higher cost in intervention group was partly due to higher number of primary care consultations and more use of physiotherapy but largely due to results from greater use of MRI	Reported associations between elements for logic model: Early access to imaging cost-effective

Dennison 2006[99] Country: UK Study design: Cross-sectional evaluation Data collection method: Electronic data analysis Aim: To assess the effect of the intervention on waiting times and attendance Detail of participants (number, any reported demographics): 54 patients referred electronically and 189 referred on paper; London hospital. 22 GPs in four practices	Intervention: Electronic surgical referral pro forma system including patient details, symptoms, urgent/routine, provisional diagnosis, free-text box Number of hours: NA Delivered by who? NA Control: Paper referrals Length of follow-up: NA Response and/or attrition rate: All referrals over a 1-year period Context (from what/who to what/who): GP to colorectal and gastroenterology clinics	Outcome measures: Waiting time referral to appointment booked Waiting time referral to clinic appointment Patient attendance rate	Main results: Patients were 21% less likely to change appointment when referred electronically. Referral to appointment was 8 weeks for electronic system, 10 weeks for paper system. Referral to booking was 0 days for electronic system, 7 days for paper system – significant difference (Mann–Whitney *U*-test no other details) 8.5% non-attendance electronic system, 22.5% paper system – significant difference (χ^2 no other details)	Reported associations between elements for logic model: Electronic referral can improve efficiency of service

Dey 2004[66] Country: UK Study design: cRCT Data collection method: NR Aim: To investigate the impact on patient management of an educational strategy to promote these guidelines among GPs Detail of participants (number, any reported demographics): 24 health centres. Two thousand, one hundred and eighty-seven eligible patients presented with acute low-back pain during the study period – 1049 in the intervention group and 1138 in the control group. Aged 18–64 years Mean age in years (SD) – 42.2 (12.1) intervention and 41.3 (12.5) control Female sex (%) –568 (54.1) intervention and 618 (54.3) control	Intervention: Practices in the intervention arm were offered outreach visits to promote national guidelines on acute low-back pain, as well as access to fast-track physiotherapy and to a triage service for patients with persistent symptoms At least two members of the guideline team attended each visit; included senior representatives from the musculoskeletal directorate, physiotherapy services and the health authority. Members of the guideline team facilitated a structured interactive discussion with the GP, which was based on the 'elaboration likelihood model of persuasion'. This discussion was used to raise awareness of the RCGP guidelines, adapted to the local context; emphasise the key messages in the guidelines; identify potential barriers to implementation; and suggest strategies for overcoming the barriers identified. GPs were given a poster reinforcing guideline recommendations and a copy of a text recommended by the RCGP for patients. Referral forms for access to fast-track physiotherapy were distributed at this session, as were forms for direct access to the back clinic of patients who had failed to respond to conservative management within 6 weeks Number of hours: NA Delivered by who? Guidance team (as above) Control: No intervention Length of follow up: 8 months Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to secondary care for low-back pain	Outcome measures: Radiography referral, sickness certificate issued, prescribed opioids or muscle relaxants, referred to secondary care, physiotherapy, or educational programmes	Main results: The estimated annual consultation rate for acute low-back pain was 35 per 1000 adults in the intervention group, compared with 38 per 1000 in the control group. There were no significant differences between study groups with respect to the proportion of patients who were referred for radiography (difference = 1.4%; 95% CI –4.1% to 6.8%), issued with a sickness certificate (difference = –1.5%; 95% CI –10.3% to 7.3%), prescribed opioids or muscle relaxants (difference = –0.03%; 95% CI –5.5% to 5.4%) or referred to secondary care (difference = 1.1%; 95% CI –0.3% to 2.6%). Significantly more patients in the intervention group were first referred to physiotherapy or to educational programmes at the back pain unit than in the control group (26.0% and 13.8%, respectively; difference = 12.2%; ICC = 0.0563; $\chi^2 = 6.49$, 1 df; $p = 0.01$; 95% CI for difference in proportion = 2.8% to 21.6%). A total of 121 (11.5%) patients in the intervention arm were referred to the triage service within the follow-up period. Of the 273 referrals to physiotherapy or the back pain unit by GPs in the intervention group, 110 (40.3%) were directed to these services by the back clinic triage service	Reported associations between elements for logic model: The management of patients presenting with low-back pain to primary care was mostly unchanged by an outreach educational strategy to promote greater adherence to RCGP guidelines among GPs

Dhillon 2003[82] Country: UK Study design: RCT Data collection method: NR Aim: To evaluate the impact of GP direct access to scanning Detail of participants (number, any reported demographics): 330 patients aged 31 to 89 years, Edinburgh. 18 general practices	Intervention: GP direct access to DXA scanning for patients at risk of osteoporosis, no specific guidelines issued Number of hours: NA Delivered by who? NA Control: Routine rheumatology clinic appointment and scan Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GP to rheumatology specialist	Outcome measures: Frequency of change of GP management following scan	Main results: Mostly clinical outcomes, but includes limited referral rate data. Before intervention the range of number of referrals for scanning was 0.01% to 0.6%, median 0.2%. Number of referrals to specialist clinic was 24 in intervention group, compared with 12 in control group Study concludes direct access more economically efficient; not fully explained in the data how this is evaluated	Reported associations between elements for logic model: Access to scanning and efficiency?
Donohoe 2000[31] Country: UK Study design: cRCT Data collection method: Questionnaires Aim: To evaluate a model of integrated diabetic foot care on identification and clinical management	Intervention: The intervention consisted of the integrated care model where the patient's feet are examined by the GP or practice nurse. It includes complementary educational interventions aimed at clarifying management of the diabetic foot, referral criteria, and the responsibilities of professionals The intervention included practice visits and education of the whole practice team	Outcome measures: Patient attitudes to value and importance of foot care Foot care knowledge (patient and professional) Use of services	Main results: Attitudes to foot care improved in both groups (mean change 3.91, 0.68) with SD in change of 3.18 (95% CI 1.29 to 5.07) between groups Patient knowledge about foot problems improved significantly in both groups (mean percentage change 1.09, 1.32, but with no significant difference in change –0.09 (95% CI –1.81 to 18.62) between groups	Reported associations between elements for logic model: Integrated care arrangements can lead to an increase number of appropriate referrals

Detail of participants (number, any reported demographics): 10 towns from mid and East Devon. Total of 1939 patients with diabetes (aged over 18 years)	Leaflets outlining patients' role and responsibility were disseminated to the practices Control: Current foot care arrangements and a practice visit where an alternative education package (on diabetic neuropathy) was given Length of follow-up: 6 months Response and/or attrition rate: Patients – intervention 68%, control 65% Professionals – intervention 80%, control 81% Context (from what/who to what/who): GP referral for diabetic foot care	Appropriate referrals from intervention practices to the specialist foot clinic rose significantly ($p = 0.05$), compared with control practices ($p = 0.14$)

Eccles 2001[54] Country: UK Study design: RCT Data collection method: A random subset of GP patients' records were examined for concordance with the guidelines Aim: To assess two methods of reducing GP requests for radiological tests in accordance with the UK Royal College of Radiologists' guidelines on lumbar spine and knee radiographs Detail of participants (number, any reported demographics): six radiology departments and 244 general practices	Intervention: A group of GPs and consultant radiologists wrote referral guidelines and educational messages for lumbar spine and knee radiographs (based on the Royal College of Radiologists' guidelines and the RCGPs' back-pain guidelines). The referral guidelines were sent by post to all GPs. Each practice was then randomly allocated to: audit and feedback, or control; and educational messages or control Feedback was prepared by the research team from routine data provided by the radiology departments. It covered the previous 6 months and was sent to GPs at the start of the intervention period and 6 months later. Feedback contained the number of requests for lumbar spine and knee radiographs made by the whole practice compared with requests made by all GPs in the study Educational messages were attached to the reports of every knee or lumbar spine radiograph requested during the 12-month intervention (e.g. 'in adults with knee pain, without serious locking or restriction in movement, radiograph is not routinely indicated') Number of hours: NA Delivered by who? Radiologists Control: Usual care Length of follow-up: 1 year Response and/or attrition rate: Of 247 practices, three dropped out Context (from what/who to what/who): GP to radiology	Outcome measures: Number of radiograph requests per 1000 patients per year	Main results: The effect of educational reminder messages (i.e. the change in request rate after intervention) was an absolute change of 1.53 (95% CI 2.5 to 0.57) for lumbar spine and of 1.61 (2.6 to 0.62) for knee radiographs, both relative reductions of about 20% The effect of audit and feedback was an absolute change of 0.07 (1.3 to 0.9) for lumbar spine of 0.04 (0.95 to1.03) for knee radiograph requests, both relative reductions of about 1% Concordance between groups did not differ significantly. Requests from doctors who had received audit and feedback were no more likely to be appropriate than requests from other doctors. The OR for lumbar spine radiographs was 0.75 (95% CI 0.52 to 1.07) and for knee was 0.82 (0.50 to 1.33). For doctors who had received educational reminder messages, the equivalent values were 0.95 (0.63 to 1.67) and 1.36 (0.86 to 2.23)	Reported associations between elements for logic model: In this study 6-monthly feedback of audit data was ineffective but the routine attachment of educational reminder messages to radiographs was effective and did not affect quality of referrals

Eley 2010[83] Country: UK Study design: Audit Data collection method: Retrospective review of electronic records Aim: To assess effectiveness of direct referral audiology clinics on ENT appointments and appropriate GP use of clinics Detail of participants (number, any reported demographics): 353 patients [178 female, 175 male, mean age 77 (60–96) years]	Intervention: DRACs for the assessment and provision of hearing aids in those over 60 years were introduced as a means of decreasing outpatient waiting times and demand on ENT appointments Number of hours: NA Delivered by who? Audiologist Control: None Length of follow-up: 4 months Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to audiology clinics or ENT	Outcome measures: ENT appointments and appropriate GP use of clinics	Main results: Of the 353 patients seen within the DRAC clinics, 320 were ultimately provided with a hearing aid. 55 patients require review by an otolaryngologist, either by direct referral or via their GP. The greatest lack of adherence to the referral criteria for DRAC appointments related to appropriate treatment of wax within the community	Reported associations between elements for logic model: DRAC continues to provide a cost benefit to the NHS by reducing demand on ENT appointments

Ellard 2012[38] Country: UK Study design: Before-and-after study (also control condition) Data collection method: All adult dermatology referrals seen between 1 April and 30 June in 2010 and 2011 (after the teaching programme) were examined using clinic letters or pro formas completed by clinicians after consultations based on NICE guidelines as criterion for appropriateness Aim: To assess the benefit of a consultant-led dermatology training programme for GPs on the number and quality of referrals to a local university teaching hospital Detail of participants (number, any reported demographics): 30 GPs from 26 practices attended the teaching programme	Intervention: All local GPs were invited to participate in six 2-hour interactive sessions on common skin conditions in early 2011 Number of hours: 6 × 2 hours Delivered by who? NR Control: 36 other local GP practices that did not participate in the training programme Length of follow up: 3 months Response and/or attrition rate: NR Context (from what/who to what/who): GP referrals to dermatology	Outcome measures: Appropriate referrals	Main results: During the 3-month study period in 2010, 542 patients were seen, of whom 39% were appropriate referrals. After the teaching programme, 478 patients were seen during the same time period in 2011, of whom 58% were appropriate. More appropriate referrals were seen in all conditions except basal cell carcinoma, where there was a fall from 100% in 2010 to 93.8% in 2011 30 GPs from 26 practices attended the teaching programme. Appropriate referrals from these GPs increased from 37.2% in 2010 to 51.8% after training, accompanied by an increase in the mean number of referrals from 20.7 to 25.7. Furthermore, the overall number of appropriate referrals increased from 37.8% to 49.5% at these 26 surgeries. These results were compared with the 36 other local GP practices that did not participate in the training programme, which also displayed an increase in appropriate referrals from 40.8% to 56.4% from 2010 to 2011 This may reflect local referral priorities, patient factors and underlying differences between the practices, suggested by the observation that the mean number of referrals in 2010 from practices attending teaching was 12.37 (SD 9.02), compared with 4.83 (SD 3.54) in those that abstained. This study has limitations in its design and size, but the results suggest that further investigation into the benefits of GP education in dermatology would be worthwhile	Reported associations between elements for logic model: During the 3-month study period (post GP training), the number of appropriate referrals increase, but control GPs also saw an increase in appropriate referral

Elwyn 2007[55] Country: UK Study design: Before and after Data collection method: NR Aim: To evaluate a system of providing feedback to clinicians following referral requests not adhering to NICE guidelines Detail of participants (number, any reported demographics): 215 GPs in catchment area of three endoscopy units	Intervention: Letter to GPs stating that two GPs would be employed part-time to assess all endoscopy letters and referrals for dyspepsia and they would be judged against recently issued NICE guidelines. Letter said that where referrals did not meet criteria, the referring doctor would be informed by letter giving reason for non-adherence to guidelines. All Wales Dyspepsia Guidelines based on NICE criteria circulated to all GPs 2 weeks earlier to this letter Referrals were processed in usual way Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 5 months Response and/or attrition rate: NA Context (from what/who to what/who): GP to endoscopy clinic	Outcome measures: Adherence to NICE guidelines Number of referrals for gastroscopy Time referral to procedure	Main results: Adherence to NICE guidelines for referral criteria increased significantly among GPs following the intervention (mean 55% to 75%, 95% CI 13.6 to 26.4; $p < 0.001$). No similar effect for hospital doctors Number of gastroscopy referrals for dyspepsia declined after the intervention; however, not significantly for GPs after inclusion of seasonal effects ($p = 0.065$) Intervention significantly reduced the referral to procedure time for gastroscopy (mean 52.1 days to mean 39.4 days, $p < 0.001$, 95% CI 6.6 to 18.6 days) Need to consider demand generated across all health care – hospital doctor referrals accounted for many more referrals than GPs (1720 bed hospital doctors referred more than 215 GPs)	Reported associations between elements for logic model: Feedback to referrers can improve adherence to referral guidelines

Emery 2007[111] Country: Australia Study design: cRCT Data collection method Aim: To evaluate the effect of an assessment strategy using the computer decision support system (the GRAIDS software), on the management of familial cancer risk in British general practice in comparison with best current practice Detail of participants (number, any reported demographics): 45 general practice teams in East Anglia Randomised to GRAIDS support [intervention ($n = 23$) or comparison ($n = 22$)]	Method: Training in the new assessment strategy and access to the GRAIDS software (GRAIDS arm) was conducted, compared with an educational session, and guidelines about managing familial breast and colorectal cancer risk (comparison) were mailed All GPs and practice nurses attended a 45-minute educational session on cancer genetics, delivered at their general practice. They were also introduced to the principles of the GRAIDS intervention Control: Current practice Length of follow-up: 12 months Response and/or attrition rate: 45/170 participated. All 45 practice teams were in the trial for a minimum of 12 months and none withdrew Context (from what/who to what/who): GP to regional cancer genetics service	Outcome measures: Proportion of referrals made to the Regional Genetics Clinic for familial breast or colorectal cancer that were consistent with referral guidelines Practitioner confidence in managing familial cancer (GRAIDS arm only) and cancer worry, risk perception and knowledge about familial cancer	Main results: There were more referrals to the Regional Genetics Clinic from GRAIDS than comparison practices (mean 6.2 and 3.2 referrals per 10,000 registered patients per year; mean difference 3.0 referrals; 95% CI 1.2 to 4.8; $p = 0.001$); referrals from GRAIDS practices were more likely to be consistent with referral guidelines [(OR) 5.2; 95% CI 1.7 to 15.8; $p = 0.006$]. Patients referred from GRAIDS practices had lower cancer worry scores at the point of referral (mean difference 1.44; 95% CI 2.64 to 0.23; $p = 0.02$) There were no differences in patient knowledge about familial cancer. The intervention increased GPs' confidence in managing familial cancer	Reported associations between elements for logic model: Compared with education and mailed guidelines, assessment including computer decision support increased the number and quality of referrals to the Regional Genetics Clinic for familial cancer risk, improved practitioner confidence and had no adverse psychological effects in patients

Eminovic 2009[86] Country: the Netherlands Study design: cRCT Data collection method Aim: To determine whether or not teledermatologic consultations can reduce referrals to a dermatologist by GPs Detail of participants (number, any reported demographics): 85 GPs from 35 general practices in two regions in the Netherlands (Almere and Zeist); five dermatologists from two non-academic hospitals were also included in the study	Method: The GPs randomised to the intervention used a teledermatologic consultation system to confer with a dermatologist, whereas those in the control group referred their patients according to usual practice The improved training programme for all intervention GPs included instructions on taking digital images, downloading images to the computer, managing files, and using the website. Dermatologists were taught how to use the website and complete the study forms All patients, regardless of their condition, were seen in the office by a dermatologist after approximately 1 month Control: Usual practice referral. In most cases this involved patients visiting the outpatient clinic with a letter in which the GP described findings pertinent to the case Length of follow up: 1 month Response and/or attrition rate: Of 56 GP practices eligible for participation, 36 (53%), including 110 GPs, agreed to participate Context (from what/who to what/who): GP to dermatology	Outcome measures: The proportion of office visits prevented by teledermatologic consultation, as determined by dermatologists	Main results: The 85 study GPs enrolled 631 patients (46 intervention GPs, 327 patients; 39 control GPs, 304 patients). The five dermatologists considered a consultation preventable for 39.0% of patients who received teledermatologic consultation and 18.3% of 169 control patients, a difference of 20.7% (95% CI 8.5% to 32.9%) At the 1-month dermatologist visit, 20.0% of patients who received teledermatologic consultation had recovered, compared with 4.1% of control patients. No significant differences in patient satisfaction were found between groups	Reported associations between elements for logic model: Teledermatologic consultation can reduce referrals to a dermatologist by 20.7%

Emmerson 2003[40] Country: Australia Study design: Evaluation questionnaire Data collection method: Surveys Aim: To develop a psychiatric assessment and advisory service for local GPs Detail of participants (number, any reported demographics): Five psychiatrists. 200 GPs in total	Intervention: Five full-time psychiatrists dedicated a 1-hour appointment per week in their hospital private practice clinics to assess patients referred by local GPs. The Psych Opinion clinic was advertised through the Division of General Practice Newsletter Number of hours: 1 per week Delivered by who? Psychiatrists Control: NA Length of follow-up: NA – 1-year project Response and/or attrition rate: NA Context (from what/who to what/who): GP to psychiatry	Outcome measures: Referral to the Psych Opinion Clinic Satisfaction with and awareness of the service	Main results: After 12 months referrals to the clinic were disappointing ($n = 30$, with 10 referrals from one GP) Feedback from GPs who had used the service showed high levels of satisfaction with the service (mean score 6.2/7) Feedback from GPs who had not used the service showed a strong endorsement of the concept (94%), but there was poor awareness of the service's existence (26%)	Reported associations between elements for logic model: This study highlights the need to market new referral interventions, both initially and on an ongoing basis

Engers 2005[67] Country: the Netherlands Study design: cRCT Data collection method: GP registration forms Aim: To assess the effectiveness of tailored interventions (multifaceted implementation strategy) to implement the Dutch low-back pain guideline for GPs with regard to adherence to guideline recommendations Detail of participants (number, any reported demographics): 41 of the 67 randomised GPs reported on a total of 616 consultations for 531 patients with non-specific low-back pain	Intervention: GPs were randomised to an intervention or a control group. The GPs in the intervention group ($n = 21$) received tailored interventions consisting of the Dutch low-back-pain guideline for GPs, a 2-hour educational and clinical practice workshop; two scientific articles on low-back-pain management; the guideline for occupational physicians; a tool for patient education; and a tool for reaching agreement on low back care with physical, exercise, and manual therapists The participating GPs were asked to recruit consecutive patients with a new episode of low-back pain as the main reason for consultation Number of hours: 2 Delivered by who? Psychologist-physiotherapist Control: The control group ($n = 20$) received no intervention Length of follow-up: NR Response and/or attrition rate: NR Context (from what/who to what/who): GP referrals for low-back pain	Outcome measures: Advice and information, referral to other health-care providers, and prescription of medication	Main results: 41 of the 67 randomised GPs reported on a total of 616 consultations for 531 patients with non-specific low-back pain. The advice and explanation provided by the GP, the prescription of paracetamol (33% vs. 21%) or non-steroidal anti-inflammatory drugs (54% vs. 62%), and prescription of pain medication on a time-contingent (70% vs. 69%) or a pain-contingent basis (30% vs. 31%), showed no statistically significant differences between the intervention and control groups. There were also no differences in overall referral rate [23% vs. 28%, OR 0.8 (95% CI 0.5 to 1.4)]. However, in follow-up consultations fewer patients were referred to a physical or exercise therapist by the GPs in the intervention group than in the control group [36% vs. 76%, OR 0.2 (95% CI 0.1 to 0.6)]	Reported associations between elements for logic model: The multifaceted intervention designed to address certain barriers to the implementation of the Dutch guideline for low-back pain for GPs was found to have minimal impact with regard to patient education, referral to a therapist, and prescription of pain medication, although the GPs studied here were already found to adhere to the guidelines to a fair extent

DOI: 10.3310/hsdr03240

Evans 2009[21] Country: UK Study design: Evaluation Data collection method: Referral data fed back to practices (patient attendance statistics) Aim: To engage GPs and consultants in discussions as to the validity, quality and appropriateness of GP referrals to increase the quality of referrals Detail of participants (number, any reported demographics): 9 of 13 interested practices selected by competitive tender	Intervention: A year-long scheme where GPs were funded for weekly protected time to discuss their referrals retrospectively through peer review, and to attend six weekly cluster meetings where representatives from the practices met with consultants to discuss the appropriateness of the referrals and the use of alternative, community-based services Number of hours: Weekly protected time (1 hour a week) Delivered by who? NA Control: None Length of follow-up: 1-year intervention Response and/or attrition rate: NA Context (from what/who to what/who): GP referrals to hospital specialists (emergency and orthopaedics in all practices, plus one of paediatrics, gastroenterology and cardiology)	Outcome measures: Quality of referral (appropriateness)	Main results: There was, on average, a significant drop in referrals between the first and fourth quarters ($z = 2.25$, $p = 0.025$) The quality of referrals ad judged by doctors' peers improved. Referral rates in orthopaedics showed a striking reduction of up to 50%. Variability between practices decreased and referral to local services increased Alternative community-based services were explored and an understanding of the best local pathways for some common conditions was reached	Reported associations between elements for logic model: The authors suggest that this peer-review intervention was a more sustainable and intuitive method of improving referrals than referral management centres

Evans 2011[22] Country: UK Study design: Service development project Data collection method: Data collected in Microsoft® Excel (Microsoft Corporation, Redmond, WA, USA) Aim: To use peer review with consultant engagement to influence GPs to improve the quality and effectiveness of their referrals Detail of participants (number, any reported demographics): 10 GP practices and seven specialties in Gwent 21 of 53 individual GPs were female (median age 44 years for females and 48.5 years for males)	Intervention: GPs discussed the appropriateness of referrals in selected specialties including referral information, and compatibility with local guidelines, usually on a weekly basis, and were provided with regular feedback of benchmarked referral rates. Six weekly cluster groups, involving GPs, hospital specialists and community health practitioners discussed referral pathways and appropriate management in community-based services Number of hours: Six weekly groups Delivered by who? NR Control: None (some comparison with practices not taking part in the study) Length of follow-up: Study length 2008–9 Response and/or attrition rate: 10 of 13 GP practices. 53 of 58 individual GPs at the end of year 1 Context (from what/who to what/who): GP referral to seven specialties	Outcome measures: Referral rate	Main results: Overall, there was a reduction in variation in individual GP referral rates (from 2.7–7.7 to 3.0–6.5 per 1000 patients per quarter), and a related reduction in overall referral rates (from 5.5 to 4.3 per 1000 patients per quarter) However, although the highest individual referrers showed a decrease, the lowest referrers may show an increase in referrals (and a significant negative correlation comparing the first month's data with the change from first to last month: $r = 0.719$, $p = 0.019$) Both reductions appeared sustainable while the intervention continued and referral rates rose in keeping with local trends once the intervention has finished	Reported associations between elements for logic model: The peer-review intervention was effective and sustainable while the intervention continued. Subsequently, referral rates rose again in line with local trends

Fearn 2009[48] Country: UK Study design: Before-and-after Data collection method: Semistructured interviews Aim: To investigate whether or not the introduction of the QOF Depression Indicators changed the pattern of referrals from primary care to a dedicated dementia clinic Detail of participants (number, any reported demographics): All referrals	Intervention: Examined all referrals from primary care physicians seen in the cognitive function clinic for the 18-month period immediately preceding (November 2004 to April 2006) and following (May 2006 to October 2007) introduction of the QOF in April 2006 Control: NA Length of follow-up: 18-months Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to a dedicated dementia clinic	Outcome measures: Referral	Main results: The percentage of all referrals to the cognitive function clinic originating from primary care was about half in both time periods and did not differ significantly between the two time periods ($\chi^2 = 0.88$, df = 1, $p > 0.1$; $z = 0.77$, $p > 0.05$) Of the referrals from primary care, about one-third referred in both time periods had dementia. The RR of a diagnosis of dementia in a primary care referral pre and post QOF was 0.55 (95% CI 0.40 to 0.74) and 0.66 (95% CI 0.49 to 0.89), respectively The null hypothesis tested was that the proportion of patients referred from primary care with dementia was the same in cohorts seen both before and after introduction of the QOF Depression Indicator (equivalence hypothesis). The result of the chi-squared test did not permit rejection of the null hypothesis ($\chi^2 = 0.54$, df = 1, $p > 0.05$), a finding corroborated by the z-test ($z = 0.60$, $p > 0.05$)	Reported associations between elements for logic model: No indication that QOF changed referral

Felker 2004[132] Country: USA Study design: Before-and-after Data collection method: Audit Aim: To evaluate a multidisciplinary mental health care team in primary care Detail of participants (number, any reported demographics): 9656 enrolled patients. Average age 53 years. 90% male PCP included 17 internal medicine physicians, 22 nurse practitioners, 10 internal medicine fellows and a variable number of residents	Method: A multidisciplinary mental health team was created consisting of a psychologist, a psychology intern, psychiatry residents, clinical social workers and a chaplain Control: None Length of follow-up: 1 year before compared with 1 year after inception Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to mental health	Outcome measures: Number of referrals to specialty mental health care services	Main results: Before implementation 543 consultations occurred over the year. Of these, 543 (38%) were subsequently referred to specialty mental health care services The following year, 560 consultations occurred, but only 81 (14%) were referred The change in referral rate was significant: $\chi^2 = 77.85$, df = 1, $p < 0.001$	Reported associations between elements for logic model: A specialist mental health team in primary care reduced referrals
Ferris 2001[145] Country: USA Study design: Before-and-after Data collection method: Record analysis Aim: To evaluate the elimination of a gatekeeping system Detail of participants (number, any reported demographics): Patients aged over 18 years, $n = 59,997$ at baseline, 29,999 intervention. Mean age 41.7 years; 53% female	Intervention: Need for referral from a primary care provider removed. Patients able to call and schedule an appointment with any specialist in the group Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 6-month study period Response and/or attrition rate: NA Context (from what/who to what/who): Patient self-referral to specialist service	Outcome measures: Absolute and relative utilisation of specialty services	Main results: Rates of visits to specialists were stable during baseline period and during the intervention period First visits to specialists, however, increased slightly from 0.19 to 0.22 per patient per 6-month period ($p < 0.001$) The average proportion of visits to eligible specialists as a percentage of all visits was 29% during the year before removal of gatekeeping and 29.6% during the year afterwards ($p = 0.39$)	Reported associations between elements for logic model: Patient direct access had small impact on initial assessment rates however little evidence of substantial increase in use of specialty services

Ferris 2002[146] Country: USA Study design: Before-and-after Data collection method: Routine data Aim: To investigate the impact of removing gatekeeping on specialist utilisation Detail of participants (number, any reported demographics): 59,952 patients	Intervention: A multispecialty primary care group discontinued a gatekeeping system on 1 April 1998. The system was previously in place for 25 years Control: NA Length of follow-up: 6 months Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Overall number and distribution of patient visits to primary care and specialist	Main results: Elimination of gatekeeping was not associated with changes in the mean number of visits to specialists (0.28 visits per 6 months before and after gatekeeping was removed), or the percentage of all children visits to specialists (11.6% vs. 12.1%, 95% CI 29.4 to 31.8 vs. 11.8 to 12.4) The proportion of all specialist visits that were initial consultations increased after gate keeping was removed from 39.6% (95% CI 29.4% to 31.8%) to 34.8% (95% CI 33.6% to 36.1%) Visits to any specialist by children with chronic disease increased from 18.6% (95% CI 17.7% to 19.1%) to 19.8% (95% CI 19.0% to 20.7%) New patient visits to specialists by children with chronic condition, as a percentage of all specialist visits increased from 28.1% (95% CI 25.9% to 30.2%) to 32.2% (95% CI 30.1% to 34.5%)	Reported associations between elements for logic model: Removal of gatekeeping resulted in only minimal changes to utilisation of specialist care overall, but visits from children with chronic conditions increased

Ferriter 2006[157] Country: UK Study design: Before-and-after Data collection method: Referral audit Aim: To identify changes in the quality of information in referrals to an old age psychiatry service before and after the introduction of the single assessment process Detail of participants (number, any reported demographics): 20 consecutive new referrals from primary care to an old age psychiatry service in north-west London for the year before the new form was introduced (April 2003 to March 2004 – from 15 different general practices) and the following year (17 practices)	Intervention: The single assessment process, a key element of the National Service Framework for Older People, was introduced to facilitate referrals between agencies and reduce duplication for patients, carers and clinicians. All referrals between agencies are now expected to be made on designated forms. Although there is no uniform national pro forma, many localities undertook rigorous consultation and development of referral forms, the use of which became mandatory for referrals to our service in April 2004. The referral form consists of several free-text sections: identity of patient and carer, identity of referrer; reason for referral; assessment of urgency; risk factors; current services provided to patient; diagnosis and recent history; current medication; signature of referrer Two senior clinicians performed independent and masked rating of each referral, using a five-point Likert scale of 'strongly agree' (1) to 'strongly disagree' (5). The raters answered the questions 'I am able to judge the appropriateness of the referral', 'I would need to seek further information before processing this referral' and 'overall I think this referral is useful' Number of hours: NA Delivered by who? NA Control: Before intervention Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Referral from primary care to old age psychiatry	Outcome measures: Referral length, legibility, information and clinical utility	Main results: The authors report that referrals were worse in all areas of quality of referral information after implementation of the single assessment process Word count decreased from 240 (SD 120) to 129 (SD 39), $p = 0.005$. Time to read in seconds increased from 96 (SD 40) to 124 (SD 41), $p = 0.001$. Illegible sections (% of) increased from 2 (10%) to 6 (30%), $p = 0.011$. The number of raters who strongly agreed or agreed with the following statements before, compared with after the single assessment process are as follows: 'I am able to judge the appropriateness of the referral' decreased from 19 to 5, $p = 0.001$ 'I would need to seek further information before processing this referral' increased from 3 to 17, $p = 0.001$ 'Overall I think the referral is useful' decreased from 17 to 3, $p = 0.001$	Reported associations between elements for logic model: The results of this small study suggest that the introduction of this particular single assessment process has impaired clinical communication between GPs and psychiatrists Note: It is clear that the practitioners did not 'like' the new process and it is unclear who the senior clinicians performing the ratings were

DOI: 10.3310/hsdr03240

Gandhi 2008[108] Country: NR Study design: nRCT Data collection method: Survey Aim: Implementation of an electronic referral tool to analyse its impact on communication between primary care and specialists Detail of participants (number, any reported demographics): 430 referrals	Intervention: Studied one practice site that implemented the referral tool and one that did not and surveyed affiliated specialists, PCPs and patients about referral communication Control: No electronic referral Length of follow-up: 2 years Response and/or attrition rate: Unclear Context (from what/who to what/who): Primary care to specialists	Outcome measures: Referral communication	Main results: Specialists more often received information before the referral visit from intervention PCPs vs. non-intervention PCPs (62% vs. 12%, $p < 0.001$), a finding that persisted after adjustment (OR = 3.3, $p = 0.008$) Intervention PCPs more often received communication from specialists (69% vs. 50%, $p = 0.08$) Patients of intervention PCPs were more likely than patients of control PCPs to report that specialists had received information before their visit (70% vs. 43%, $p = 0.007$)	Reported associations between elements for logic model: Electronic referral can improve communication

Glaves 2005[57] Country: UK Study design: Before-and-after Data collection method: Clinical data Aim: To determine if the use of request guidelines can achieve a sustained reduction in the number of radiographic examinations of the cervical spine, lumbar spine and knee joints performed for GPs Detail of participants (number, any reported demographics): All GPs referring to the three community hospitals	Method: GPs referring to three community hospitals and a district general hospital were circulated with referral guidelines for radiography of the cervical spine, lumbar spine and knee, and all requests for these three examinations were checked. Requests that did not fit the guidelines were returned to the GP with an explanatory letter and a further copy of the guidelines. Where applicable, a large joint replacement algorithm was also enclosed. If the GP maintained the opinion that the examination was indicated, she or he had the option of supplying further justifying information in writing or speaking to a consultant radiologist Control: None Length of follow-up: 1 year Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for radiographic examinations of the cervical spine, lumbar spine and knee joints	Outcome measures: Referral	Main results: Over all sites and for all three examinations, the total number of examinations fell by 68% in the first year (95% CI 67% to 69%), achieving a 79% reduction in the second year (95% CI 78% to 80%). Knee radiographs fell by 64% in the first year (95% CI 62% to 65%), achieving a 77% reduction in the second year (95% CI 75% to 79%). Lumbar spine radiographs fell by 69% in the first year (95% CI 68% to 71%), achieving a 78% reduction in the second year (95% CI 77% to 80%). Cervical spine radiographs fell by 76% in the first year (95% CI 74% to 78%), achieving an 86% reduction in the second year (95% CI 84% to 88%). The *p*-value for all of these reductions was 0.0001 (highly significant). The largest individual reduction was 92% for cervical spine radiographs at Whitworth Hospital. The lowest reduction was 74% for lumbar spine radiographs at Buxton Hospital. For knee radiographs, the range was 75% to 86%; for lumbar spine radiographs, the range was 74% to 89%; and for cervical spine radiographs, the range was 80% to 92%	Reported associations between elements for logic model: The use of referral guidelines, reinforced by request checking and clinical management algorithms, can produce a dramatic and sustained reduction in referral

Gough-Palmer 2009[84] Country: UK Study design: Retrospective record analysis Data collection method: Analysis of GP requests for MRI scans Aim: To evaluate 12 years of GP open access to MRI scans Detail of participants (number, any reported demographics): 1798 scans requested by 209 GPs	Intervention: GP access to MRI scans. No protocol, guidance or formal consultant or radiologist vetting Number of hours: NA Delivered by who? NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to MRI scanning	Outcome measures: Number of referrals Type of scan Severity of reported findings	Main results: GP-requested scans as percentage of workload of department are low (around 2.6%). While workload of department increased over study period, this percentage remained stable Spine, knee and brain imaging were 86% of requests. 48% of scans requested were normal or minor degenerative changes. 26% demonstrated serious pathology warranting hospital referral Wide range of scans requested per requester; average 8.5, varied from 1 to 240	Reported associations between elements for logic model: Marked discrepancy between GPs, suggesting need for referral guidelines While the rate of no identified abnormality was 48%, a normal scan could be beneficial in providing rapid patient reassurance, return to work and a reduction in outpatient referrals Demand for complex areas very low

Greiver 2005[114] Country: UK Study design: cRCT Data collection method: NR Aim: To determine the effectiveness of a PDA software application to help family physicians to diagnose angina among patients with chest pain Detail of participants (number, any reported demographics): 18 family physicians belonging to the North Toronto Primary Care Research Network (Nortren) or recruited from a local hospital	Intervention: Intervention physicians received a Palm PDA (which included the angina diagnosis software). Physicians prospectively recorded the process of care for patients aged 30 to 75 years presenting with suspected angina, over 7 months Number of hours: NA Delivered by who? NA Control: Continue conventional care Length of follow-up: 7 months Response and/or attrition rate: NR Context (from what/who to what/who): GP to cardiology	Outcome measures: Frequency of cardiac stress test orders for suspected angina The appropriateness of referral for cardiac stress testing at presentation and for nuclear cardiology testing after cardiac stress testing Secondary outcome was referrals to cardiologists	Main results: 14 of the 28 patients in the control arm (50%) and 30 of the 37 patients in the PDA arm (81%) were referred for cardiac stress tests ($p = 0.007$), an absolute difference of 31% (95% CI 8% to 58%) There was a trend towards more appropriate use of stress testing (48.6% with the PDA vs. 28.6% control), an increase of 20% ($p = 0.284$, 95% CI –11.54% to 51.4%). There was also a trend towards more appropriate use of nuclear cardiology following cardiac stress testing (63.0% vs. 45.5%), an absolute increase of 17.5% ($p = 0.400$, 95% CI –13.9% to 48.9%) Referrals to cardiologists did not increase (38.2% with the PDA vs. 40.9%, $p = 0.869$). A referral was more likely to have been made if the final diagnosis was angina (likelihood ratio for referral 15.455, 95% CI 2.124 to 112.431); in other words, family physicians appeared to refer appropriately	Reported associations between elements for logic model: A PDA-based software application can lead to improved care for patients with suspected angina seen in family practices; this finding requires confirmation in a larger study

Griffiths 2006[58] Country: UK Study design: cRCT Data collection method: Dermatologists completed a standardised pro forma on all patients seen in their clinic with a diagnosis of psoriasis who had been referred from primary care Aim: To assess the effectiveness of guidelines and training sessions on the management of psoriasis in reducing inappropriate referrals from primary care Detail of participants (number, any reported demographics): Patients aged 18 years or over with psoriasis (165 health centres). *n* = 188	Intervention: Health centres in the intervention arm received guidelines on the management of psoriasis in primary care, developed by local dermatologists, supplemented by the offer of a practice-based nurse-led training session; those in the control arm received neither guidelines nor training sessions Number of hours: NR Delivered by who? Training delivered by nurse Control: No intervention Length of follow-up: Response and/or attrition rate: Outcome data were available for 188 of the 196 eligible patients Context (from what/who to what/who): Referral from primary care to dermatology for psoriasis	Outcome measures: Anonymised pro formas were assessed by three members of an expert panel, comprising a dermatologist, a GP and a dermatology specialist nurse Referral was considered appropriate if the patient fulfilled any of the following criteria: extent of disease 20% of body surface area; unstable disease; no improvement following topical treatment (as per guidelines, for 6–8 weeks); or, when following dermatological assessment, the patient was admitted to hospital, was referred to our day treatment centre or to the dermatology nursing service, or received phototherapy or systemic therapy	Main results: 82 health centres were randomised to the intervention arm and 83 were randomised to the control arm. Outcome data were available for 188 of the 196 eligible patients referred during the study period Patients in the intervention arm (82/105) were significantly more likely to be appropriately referred in comparison with patients in the control arm 49/83) (difference = 19.1%; OR 2.47; 95% CI 1.31 to 4.68; ICC = 0) Only 25 (30%) health centres in the intervention arm took up the offer of training sessions There was no significant difference in outcome between health centres in the intervention arm that received a training session and those that did not (OR 1.28, 95% CI 0.50 to 3.29; ICC = 0)	Reported associations between elements for logic model: Dissemination of guidelines on the management of psoriasis in primary care improved the appropriateness of referral of patients to secondary care

Gurden 2012[133] Country: UK Study design: Before-and-after Data collection method: Questionnaire Aim: To describe and evaluate a community-based musculoskeletal service Detail of participants (number, any reported demographics): $n = 696$. Adult patients presenting to their GP with back or neck pain; mean age 52 years; two-thirds female; just over half in paid employment	Intervention: Patients still having pain after 4–6 weeks' 'usual GP care' offered a course of manual therapy and referred to private provider of their choice. Seen within 14 days Number of hours: Six treatments over 8 weeks. Practitioners worked to agreed protocols Delivered by who? Independent providers of chiropractic, osteopathy and physiotherapy services Control: None Length of follow-up: Until discharge from service (usually 8 weeks) Response and/or attrition rate: 696 of the 2810 seen by the service Context (from what/who to what/who): Community-based musculoskeletal service	Outcome measures: Bournemouth Questionnaire (for back and neck pain) Bothersome Scale Global Improvement Scale Patient satisfaction with treatment	Main results: Percentage change in scores baseline to discharge – Bournemouth Questionnaire = 64.6% patients categorised as improved, Bothersome Scale = 69.9% categorised as improved, Global Improvement Scale = 67.8% improved 99.5% satisfied or very satisfied with the treatment, 3% referred back to GP with recommendation for referral to secondary care services 97% given self-management advice and recommended for discharge 'evaluation by PCT demonstrated reduced primary care consultations, imaging and inappropriate referrals to secondary care'	Reported associations between elements for logic model: Referrals to spinal surgeons reduced by more than 25%
Hands 2001[34] Country: UK Study design: Before-and-after Data collection method: Surveys Aim: To evaluate the effectiveness of an education interaction between consultants and GPs Detail of participants (number, any reported demographics): 22 consultants; 21 GPs	Intervention: GPs attended outpatient sessions in different clinical specialties of their choice. Completed a questionnaire immediately after the session and at 6 months Control: NA Length of follow-up: 6 months Response and/or attrition rate: 21/150 Context (from what/who to what/who): GP to specialist	Outcome measures: Referral	Main results: GPs reported changes in their clinical behaviour which appear to have been maintained at 6 months GPs stated that referral was discussed/ taught in 83% of interactions. Immediately after the session, 25% of GPs thought that this would change their referral behaviour. After 6 months, 29% reported behaviour change in reference to referral Behaviour change was also reported with regard to diagnosis (42%), management (79%), prescribing (54%), and practical skills (58%)	Reported associations between elements for logic model: Unclear

Harrington 2001[93] Country: USA Study design: Case series Data collection method: Review of patient records, survey of patient views Aim: To evaluate the impact of guidelines on referral and a referral management programme Detail of participants (number, any reported demographics): Patients with low-back pain, records of 581 patients reviewed over 1 year	Intervention: Referral management programme – guidelines for referral including a flow chart (algorithm) for care, plus system for separating urgent cases from others – physician contacts surgeon or managers for advice on patients with red flag symptoms as per guidelines, receptionist takes information, information verified by nurse co-ordinator, physician manager reviews information obtained to determine care plan instigated by nurse co-ordinator Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 3 years' data reviewed, 1 year pre, transition year, year after implementation Response and/or attrition rate: NA Context (from what/who to what/who): GP to spine orthopaedists	Outcome measures: Patient visits for low-back pain to either a primary care or a specialist care provider	Main results: Following introduction of the guidelines little change was documented from traditional referral patterns (no other information). Three years later in response to long waiting lists the referral management programme was put in place Shift of care from spine orthopaedists to primary physicians. Before, 28% of patient visits for low-back pain were to specialist care and 72% were to primary care. During transition year 13% of patient visits were to specialist care and 87% were to primary care Year after implementation 17% of visits were to specialist care and 83% of visits were to primary care Total patient visits for low-back pain increased 16% over the time period from 7988 to 9297. Estimated cost saving of $4000,000 per year in manpower cost. 90% of patients were satisfied with referral management process	Reported associations between elements for logic model: Pre-appointment management can reduce specialty appointments (although shifts appointments to primary care)

Heaney 2001[159] Country: UK Study design: RCT Data collection method: Use of health services audited from patients' general practice notes in 12 months after receipt of booklet Aim: To investigate the effect of patient information booklets on overall use of health services Detail of participants (number, any reported demographics): 20 general practices in Lothian, Scotland Random sample of patients from the community health index ($n = 4878$) and of those contacting out-of-hours services ($n = 4530$) in the previous 12 months in each of the study general practices	Intervention: Booklets were posted to participants in intervention groups (3288 were sent 'What Should I Do?' and 3127 were sent 'Health Care Manual'). Patients randomised to control group (2993) did not receive a booklet 'What Should I Do?' was part of a patient education programme implemented in the Netherlands in 1993. The booklet outlines 40 common health problems and provides information on when to consult a doctor and on self-care, when appropriate 'Health Care Manual' was developed by a GP and a practice nurse in Dunkeld, Scotland. It outlines about 50 common health problems and also provides information about keeping healthy Control: No booklet Length of follow-up: 12 months Response and/or attrition rate: The final response rate from general practices was 20/30 (67%) Context (from what/who to what/who): Patient use of GP services	Outcome measures: Types of service use, interactions between use, deprivation category of the area in which respondents live, and age	Main results: Receipt of either booklet had no significant effect on health service use compared with a control group Total contacts: Book – before 4.19, after 4.20 Control – before 3.95, after 3.91 Difference (95% CI) 0.14 (–0.18 to 0.45) However, 9 out of 10 matched practices allocated to receive Health Care Manual had reduced consultation rates compared with matched practices allocated to 'What Should I Do?'	Reported associations between elements for logic model: Widespread distribution of information booklets about the management of minor illness is unlikely to reduce demand for health services

Hemingway 2006[73] Country: UK Study design: Before-and-after Data collection method: NR Aim: To evaluate a protocol-driven referral system for colorectal cancer tests Detail of participants (number, any reported demographics): eight colorectal surgeons and 10 GI physicians	Intervention: Leicester Colorectal Test Protocol – included list of presenting symptoms, age criteria for test and appropriate diagnostic test for each symptom. Patients had investigation before seeing outpatient clinician or on the day of the clinic. Referrals processed by '2-week wait' administration staff using the protocol and assessments booked by these administration staff Protection of slots within the testing suites Referrals not complying with protocol were redirected to appropriate test without referral back to GP Number of hours: NA Delivered by who? Predominantly administrators in department Control: None Length of follow-up: Up to 2-year period Response and/or attrition rate: NA Context (from what/who to what/who): GP to colorectal outpatient clinic	Outcome measures: Time referral to diagnosis Percentage of patients referred as urgent who were seen within 31-day target timescale	Main results: Data for intervention period were not clear; reported by year rather than before and after Baseline before protocol: Year 1 median time to diagnosis non-emergencies 35 days (interquartile range 13–80), fast-track (categorised as 2-week wait or 'soon') 21 days (10–48) 62% of cancers referred as either 2-week wait or 'soon' were diagnosed within 31 days Year 2 non-emergencies 22 (9–59) emergencies 15 (7–37) After introduction of protocol (pilot and full implementation): Year 3 non-emergencies 20 (10–59) emergencies 13 (8–29) Year 4 non-emergencies 20 (10–51) emergencies 13 (9–23) During the 2-month full implementation period during year 3 service received 256 referrals, 64% came through 2-week wait protocol office and 36% referred directly to consultants. In these referrals 70% were diagnosed with a pathology and 19 patients were diagnosed with cancer, all within 31 days Overall, during year 3 79% of patients with colorectal cancer diagnosed who were referred as 2-week wait or 'soon' were diagnosed within 31 days; in year 4 the figure was 82%	Reported associations between elements for logic model: Protocol-driven intervention had a positive impact on speed of diagnosis

Hermush 2009[137] Country: Israel Study design: Before-and-after Data collection method: Retrospective examination of patient data Aim: To describe and evaluate a new model used in caring for the elderly in the community Detail of participants (number, any reported demographics): $n = 512$ elderly patients; mean age 79 years; 66% female	Intervention: GP refers difficult or complex cases to a geriatrician who carries out a clinic in the same primary care location Number of hours: NA Delivered by who? Geriatrician Control: None Length of follow-up: Data collected over 3 years Response and/or attrition rate: 5086 patients over 65 years treated in the time frame Context (from what/who to what/who): Large primary care clinics in a city to geriatrician	Outcome measures: Number of referrals Type of clinical problem	Main results: Referrals to geriatrician increased significantly from 133 at baseline to 207 2 years later ($p = 0.01$) Number of visits to GP decreased in the 6 months following the consultation with the geriatrician ($p < 0.01$)	Reported associations between elements for logic model: Relocation of specialist service to primary care can increase referrals

Hill 2000[49] Country: UK Study design: Before-and-after (audit) Data collection method: GP audit Aim: To assess how appropriate referrals were just before and after distribution of the guidelines Detail of participants (number, any reported demographics): 33 GP practices. Data on 155 patients pre distribution of guidelines and 153 patients post distribution. In the 2-year follow-up audit, a sample of 114 new patients, seen consecutively over a period of 3 weeks, was taken	Intervention: Referral guidelines for dermatology were compiled by the dermatologist at the Royal Surrey County Hospital in consultation with local GPs. An audit was undertaken to assess how appropriate referrals were just before and after distribution of the guidelines and was repeated 2 years later to determine whether or not they had made any significant impact Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 2 years Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to dermatology	Outcome measures: Appropriate referrals	Main results: In the original audit a 40% increase in the numbers of referrals which were recorded by the dermatologist as appropriate immediately after the guidelines were sent (from 57% to 80%) was seen. The 2-year follow-up audit, however, demonstrated that the improvement had not been sustained, with a decline to 48% appropriate referrals Five common conditions accounted for two-thirds of inappropriate referrals before and after the guidelines were sent	Reported associations between elements for logic model: In response to referral guidelines, appropriate referrals increased in the short term but did not persist The need for continued GP education in dermatology to reinforce referral guidelines is demonstrated

Hilty 2006[24] Country: USA Study design: Before-and-after Data collection method: Videoconferencing consultations Aim: To assess changes over time in the utilisation of telepsychiatric services by individual PCPs and clinics in rural areas Detail of participants (number, any reported demographics): First 200 and the subsequent 200 telepsychiatric initial consultations	Intervention: 400 consecutive patients received an initial telepsychiatric consultation delivered from an academic medical centre to rural or suburban primary care sites from July 1996 to December 2002 The following educational strategies were implemented: 1. Regular CME lectures 2. PCPs' participation in consultations: PCPs present their patients at the beginning of the sessions, and get direct feedback at the end 3. Consultation notes for PCPs: A note by the psychiatrist was sent within 10 minutes of each consultation in a deliberately educational style. A dictation of two to three pages was sent in about 5 working days 4. Telephone consultations with the psychiatrist Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to psychiatry	Outcome measures: Patient demographics, diagnoses, reason for consultation, medication dosing and satisfaction	Main results: Adult patients were primarily referred for mood and anxiety disorders, particularly for diagnosis and medication treatment planning. Over time, PCPs significantly improved medication dosing and asked for more treatment planning help. PCPs' satisfaction also improved over time Among the first 200 consultations, only 47.4% of the medication doses for depressive and anxiety disorders were adequate, according to national guidelines. Among the second 200 consultations, dosing adequacy improved to 63.6% ($p < 0.001$) PCPs rated the quality of consultation as significantly higher over time (95% CI 4.45 to 4.83; $p < 0.001$), and likewise with overall satisfaction (95% CI 4.49 to 4.73; $p < 0025$)	Reported associations between elements for logic model: Telepsychiatric consultation, in combination with specific educational interventions, appears to facilitate the enhancement of skills and knowledge of PCPs

Hockey 2004[91] Country: Australia Study design: Longitudinal (no control) evaluation Data collection method Aim: To examine the feasibility of a low-cost store and forward teledermatology service for GPs in regional Queensland Detail of participants (number, any reported demographics): 63 referrals	Intervention: Digital pictures and a brief case history were transmitted by e-mail. A service co-ordinator carried out quality-control checks and then forwarded the messages to a consultant dermatologist. The co-ordinator returned the message to the GP. The aim was to provide advice to rural GPs within 1 working day Control: None Length of follow-up: None (6-month study) Response and/or attrition rate: NA Context (from what/who to what/who): GP to dermatology	Outcome measures: Referral	Main results: Over 6 months, 63 referrals were processed by the teledermatology service. In the majority of cases, the referring doctors were able to treat the condition after receipt of e-mail advice from the dermatologist. In 10 cases (16%) additional images or biopsy results were requested because image quality was inadequate The average time between a referral being received and clinical advice being provided was 46 hours	Reported associations between elements for logic model: Unclear

Hughes-Anderson 2002[136] Country: Australia Study design: Before-and-after Data collection method: Prospective data collection from all patients undergoing upper and lower endoscopy procedures between January 1996 and June 2000 Aim: To assess whether or not an outreach surgical service offering open-access endoscopy to rural areas was being overutilised Detail of participants (number, any reported demographics): A total of 4400 patients were seen by the outreach programme in the 5 years 1996–2000 The mean age of patients was 50.8 years (range, 15–94 years); 45% were women	Intervention: Indications for referral between the GPs and the visiting surgeons were reviewed in patient records and assessed for compliance with the American Society for Gastrointestinal Endoscopy (ASGE) guidelines Two groups of patients were defined: those referred directly for open-access endoscopy and those selected by the surgeons. The open-access endoscopy patients were assessed on the day, prior to the procedure by the visiting surgeon Records for all patients undergoing colonoscopy were reviewed to determine the reason and number of cancelled procedures Control: None Length of follow-up: January 1996 to June 2000 Response and/or attrition rate: NR Context (from what/who to what/who): GP referral for endoscopy	Outcome measures: The groups were analysed for appropriateness of referrals and frequency of positive pathology investigations	Main results: A total of 772 endoscopies were performed and 75% were booked as open-access services. The referral rate for procedures was greater for GPs (583: 75%) than for the visiting surgeons (189: 25%) The overall compliance rate for approved indications using the ASGE guidelines for both groups was 92%. There was no significant difference in pathology found between groups The appropriateness of referrals for colonoscopy indicated that 28 of the colonoscopies were outside the ASGE indications. There was no significant difference between the two groups on the basis of the guidelines Difference between GP and visiting surgeon (appropriate indications) for endoscopy is 3.2%, 95% CI –1.8% to 8.2%; $p = 0.34827$, not significant Difference between GP and visiting surgeon (appropriate indications) for colonoscopy is 6.8%, 95% CI –1.8% to 15.4%; $p = 0.14782$, not significant	Reported associations between elements for logic model: Outreach surgical service did not induce unnecessary procedures

Idiculla 2000[44] Country: UK Study design: retrospective survey Data collection method: Referral letter contents Aim: To ascertain whether or not local guidelines for diabetes management influence the content of GP referral letters to a diabetes specialist clinic Detail of participants (number, any reported demographics): 400 GP referral letters	Intervention: Analysis of 200 GP referral letters submitted before (set 1) and 200 submitted after (set 2) local guidelines on the management of adult diabetes had been issued to local GPs The frequency with which micro- and macro-vascular complications of diabetes were documented in the GP letters was compared with frequency ascertained at the first attendance at the specialist clinic Control: None Length of follow-up: None Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for diabetes complications	Outcome measures: Content of referral letters	Main results: Following the distribution of the guidelines there was no significant change in the frequency with which specific conditions were documented in referral letter (set 1 vs. set 2): hypertension 72 vs. 79%, cerebrovascular disease 89 vs. 80%, etc. Many unreported complications were found in painters who had been referred after various periods of treatment in primary care However, the guidelines did appear to have encouraged the active treatment of hyperglycaemia by GPs before referral	Reported associations between elements for logic model: Diabetes guidelines had very little effect on increasing the information provided in GP referral letters
Imkampe 2006[47] Country: UK Study design: Before-and-after Data collection method: Aim: To determine whether or not GP grading of referrals into urgent and non-urgent had improved after the introduction of the 2-week rule was introduced Detail of participants (number, any reported demographics): All new GP referrals	Intervention: A retrospective review of GP referrals over 8 months, between September 2003 and April 2004, with regard to their urgency, subsequent diagnosis and the use of pro formas (standardised referral formats) was carried out. The results were compared with the 1999 audit Control: None Length of follow-up: None Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for breast cancer	Outcome measures: Appropriate referral	Main results: 82 of 1178 patients referred by GP had breast cancer vs. 115 of 1176 patients referred in 1999. Sixty-eight per cent (56/82) of breast cancer patients were referred as urgent, compared with 47% (54/115) in 1999 ($p = 0.005$) A pro forma was used in 47% (548/1178) of GP referrals, while no pro forma was used in 1999 Sixty-five of the 82 cancer patients were referred with a pro forma and 85% (55/65) were referred as urgent	Reported associations between elements for logic model: GP prioritisation of referrals has improved since 1999. With the use of pro formas a significant number of patients with cancer were referred urgently

Iversen and Luras 2000[151] Country: Norway Study design: Economic analysis and modelling Data collection method: NR Aim: To explore whether or not the payment system for GPs has an impact on referral Detail of participants (number, any reported demographics): 150 GPs across four municipalities	Intervention: Change from contract system (whereby GP receives a fixed practice allowance plus charges fee per item to each patient) to a capitation system where each person registers with a particular GP and GP income based on the number of patients on their list Number of hours: NA Delivered by who? NA Control: None Length of follow-up: Study over 3 years Response and/or attrition rate: 37% of GPs who took part in the intervention provided data Context (from what/who to what/who): GP to specialist	Outcome measures: Number of referrals to specialists	Main results: In the capitation system where GP income is determined by number of patients on list the GP referral rates to specialists increased by 42%. It was hypothesised that it is less profitable for the GP to provide services themselves and more profitable for them to let the specialists provide the services Number of years GP practised in the area did not have a significant impact on referral rate	Reported associations between elements for logic model: Model of GP payment and referral rate
Jaatinen 2002[95] Country: Finland Study design: RCT Data collection method: Questionnaires Aim: To consider teleconsultation as a replacement for referral to an outpatient clinic Detail of participants (number, any reported demographics): 93 patients. After non-attendance, $n = 54$ intervention and $n = 24$ control	Intervention: GPs had to decide whether to refer for electronic consultation with the hospital, or whether to refer to outpatients as usual. Electronic communication with the hospital was through a secure web-based system Control: Conventional referral letter sent to hospital outpatient clinic Length of follow-up: None – 5-month study Response and/or attrition rate: 15 non attendees Context (from what/who to what/who): GP to specialist	Outcome measures: Referral satisfaction	Main results: All patients treated by teleconsultation said they wanted the same procedure in the future and 63% of the control group said they would prefer a teleconsultation next time ($p = 0.02$), although they were nearly as satisfied as those who received a teleconference ($p = 0.37$) The doctors quickly learned to exploit the telecommunication model. The responsibility for treatment was maintained with the primary-care centre in 52% of cases using teleconsultation without any hospital visit required. The GPs and doctors agreed on follow-up treatment	Reported associations between elements for logic model: Teleconsultation increased the probability of GPs maintaining responsibility for treatment

Jiwa 2004[23] Country: UK Study design: nRCT Data collection method Aim: To determine if written feedback about the contents of GP referral letters mediated by local peers was acceptable to GPs and how this feedback influenced the content and variety of their referrals Detail of participants (number, any reported demographics): 26 GPs	Intervention: In a controlled trial, 26 GPs were offered written feedback about the documented contents of their colorectal referral letters over 1 year. The feedback was designed and mediated by two nominated local GPs. The contents of referral letters were measured in the year before and 6 months after feedback. GPs were asked about the style of the feedback. The contents of referral letters and the proportion of patients with organic pathology were compared for the feedback GPs and other local GPs who could be identified as having used the same hospital for their referrals in the period before and after feedback Control: Control subjects were up to 50 practitioners who referred to the same local district general hospital Length of follow-up: 1 year before and 6 months after feedback Response and/or attrition rate: None withdrew from the project Context (from what/who to what/who): GP referral to specialist	Outcome measures: Referral letter quality	Main results: All GPs declared the method of feedback to be acceptable but raised concerns about their own performance, and some were upset by the experience There was a difference of 7.1 points (95% CI 1.9 to 12.2 points) in the content scores between the feedback group and the controls after adjusting for baseline differences between the groups There was a considerable improvement in the content of the referral letters from the feedback group from before to after feedback as illustrated below. There was no improvement in the scores for the control group in the same period Feedback group/control group: Mean scores before feedback 34.1/28.2 Mean scores after feedback 39.5/28.7 Mean difference and CIs 5.3 (1.5 to 9.2)/0.55 (–1.4 to 2.5); *t*-test df 20/36; $p = 0.008/0.6$ Of the GPs who referred to the same hospital before and after feedback, the feedback GPs referred more patients with organic pathology than other local colleagues	Reported associations between elements for logic model: In some cases feedback improves the content of GP referral letters and may also impact on the type of patients referred for investigation by specialists

Jiwa 2006[68] Country: UK Study design: cRCT (clustered by practice) Data collection method: Semistructured interviews were conducted to identify key themes relating to the use of the software. Questionnaire to practitioners and interview Aim: To evaluate a referral guideline intervention for lower bowel symptoms Detail of participants (number, any reported demographics): From 150 invitations, 44 practices were recruited with a total list size of 265,707. 44 practices with 180 GPs and 504 patients over 6-month period. GPs aged 30–60 years	Intervention: Practices were offered an electronic interactive referral pro forma, an educational outreach visit by a local colorectal surgeon, both or neither 1. Pro forma: They developed and piloted an interactive electronic pro forma for processing referrals to colorectal surgeons (General Practice Referral Assessment Facilitator or G-RAF). The interactive pro forma requested information on drop-down menus for 15 clinical signs and symptoms previously identified by GPs and colorectal surgeons as those of significant colorectal disease. The interactive software offered the practitioner guidance on which cases needed urgent referral with reference to current UK Department of Health guidelines. A referral letter was automatically produced seeking an appropriate appointment at a hospital clinic 2. Education: A colorectal surgeon delivered short educational sessions. During the 45-minute educational outreach meeting, the presenter summarised the features of significant organic colorectal disease and encouraged questions. The published guidelines and the potential for the improvement to the management of patients were emphasised	Outcome measures: The main outcome measure was the proportion of cases with severe diverticular disease, cancer or precancerous lesions and inflammatory bowel disease in those referred by each group A secondary outcome was a referral letter quality score	Main results: There were 716 consecutive referrals recorded over a 6-month period, of whom a diagnosis was available for 514 In the combined software arms 14% (37/261) had significant pathology, compared with 19% (49/253) in the non-software arms, RR 0.73 (95% CI 0.46 to 1.15) In the combined educational outreach arms 15% (38/258) had significant pathology compared with 19% (48/256) in the non-educational arms, RR 0.79 (95% CI 0.50 to 1.24) Pro forma practices documented better assessment of patients at referral Pilot work suggested proportion of patients referred with significant pathology is approximately 0.14. Only 18% of referrals in intervention one arm used the software. No significant difference in proportion of cases with significant pathology for either intervention or compared with no intervention Point estimates suggest that the interventions performed worse than no intervention. About a 4% absolute improvement; intervention arms could give as much as a 7% lower absolute percentage in referrals with significant pathology than control	Reported associations between elements for logic model: There was a lack of evidence that either intervention increased the proportion of patients with organic pathology among those referred. The interactive software did improve the amount of information relayed in referral letters although we were unable to confirm if this made a significant difference to patients or their health-care providers The potential value of either intervention may have been diminished by their limited uptake Computer pro forma systems unpopular as administrative burden shifted to clinicians from administrative staff Study did not take account of how innovation was to be used in practice and impact on professional identify and established practices

	3. Both interventions Number of hours: Education = 45 minutes Delivered by who? Local colorectal surgeon Control: No intervention Length of follow-up: NR Response and/or attrition rate: From 150 invitations, 44 practices were recruited Context (from what/who to what/who): GP referral to a colorectal surgeon	Themes in interviews: Concerns regarding the pro forma creating an additional task in the process – quicker to dictate a letter, and therefore poor adoption of the software The 'don't know if it is cancer' option led to processing as an urgent referral, whereas most referrals were because the GP did not know for sure – potential overuse of urgent referral slots

Jiwa 2012[105] Country: Australia Study design: Before-and-after study Data collection method: Analysis of referral letters Aim: To explore if increasing the amount of relevant information in referral letters between GPs and hospital specialists helps in the scheduling of appointments for patients Detail of participants (number, any reported demographics): NR	Intervention: Referral Writer Software – a software system to assist referral writing, consisting of a pro forma that selects relevant information from the electronic patient record and requests the doctor to choose one of six specialties for referral: urology, breast, gynaecology, upper GI, colorectal and respiratory. The doctors were finally prompted to enter details about the patient's condition The amount of relevant information in the referral letters were assessed with reference to a published schedule 3 months before and 4 months after the intervention start date The letters were scored by a researcher for the amount of relevant information and independently checked by two specialists to determine if the urgency of the referral could be established, and what the most likely outcome was. This was later compared with the actual diagnosis Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 4 months after intervention start Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Relevant information in referral	Main results: Each GP referred 5.6 patients on average (range 1–14) before the RW and 4.8 patients (range 0–14) after the RW. The amount of relevant information in the referrals improved substantially after the RW, mean difference 37%, 95% CI 43% to 30%; $p < 0.001$ For 91% of referrals after the RW, both specialists in each specialty were confident or very confident that they had enough information to decide when the patient should come to their clinic; this increased from 50% before RW, $p = 0.001$ There was no association between the amount of relevant information and the final diagnosis	Reported associations between elements for logic model: Standardising and using electronic communications to refer appears to facilitate referral scheduling of specialist appointments

Johnson 2008[139] Country: UK Study design: Cross-sectional analysis of services and referral patterns Data collection method: Survey Aim: Does the provision of acupuncture in primary care reduce need for referral? Detail of participants (number, any reported demographics): Three PCTs; rural and urban mix. 109 practices; 13% offered acupuncture service	Intervention: Acupuncture service in primary care Number of hours: NA Delivered by who? Acupuncture clinic Control: None Length of follow-up: NA Response and/or attrition rate: 57% response to first e-mail, 73% to second e-mail, remaining practices contacted by telephone Context (from what/who to what/who): Specialist clinic provided in primary care	Outcome measures: Referral rate to orthopaedic, pain, physiotherapy, rheumatology Cost of painkillers	Main results: 'No evidence from the data that provision of acupuncture is associated with lower referral rates' Note: Data presented outline mean referral rates for practices providing acupuncture clinics and 'some' versus 'higher' number of acupuncture appointments but NOT practices with no acupuncture, so this conclusion needs modification. Wide variation between different PCTs. Variation between PCTs possibly associated with local differences in referral patterns and sociodemographic characteristics	Reported associations between elements for logic model: Variation between referral rates between providers

Joyce 2000[147] Country: USA Study design: Retrospective study Data collection method: Retrospective analysis of routine patient data Aim: To assess utilisation of ambulatory visits to primary care physicians and to specialists in two different managed care models – a closed-panel gatekeeper health maintenance organisation (HMO) and an open-panel point-of-service HMO Detail of participants (number, any reported demographics): 16,192 working-age members of the gatekeeper HMO and 36,819 working-age members of the point-of-service HMO	Intervention: Retrospective study of patients enrolled in a single managed care organisation with two distinct product lines – a gatekeeper HMO and a point-of-service HMO. Both plans shared the same physician network Estimated the number of primary care physician and specialist visits using negative binomial regression models and predicted the number of visits per year for each person under each HMO type and copayment option Number of hours: NA Delivered by who? NA Control: Two different managed care models Length of follow-up: 2 years Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to specialists	Outcome measures: Referral, number of visits	Main results: There were more annual visits to primary care physicians and a greater number of total physician visits in the gatekeeper HMO than in the point-of-service plan. However, they did not observe higher rates of specialist visits in the point-of-service HMO	Reported associations between elements for logic model: No evidence that direct patient access to specialists leads to higher rates of specialty visits in plans with modest cost-sharing arrangements

Julian 2007[62] Country: UK Study design: nRCT Data collection method: Referral data and patient diaries Aim: To examine the outcomes of an integrated model that lends weight to GP-led care Detail of participants (number, any reported demographics): Large teaching hospital and GP practice; 99 Bridges, 94 one-stop menstrual clinic	Intervention: Women attending the new Bridges pathway were compared with those attending a consultant-led one-stop menstrual clinic The Bridges pathway involved the use of shared care evidence-based guidelines for the management of patients in primary and secondary care, which determined the timings for investigations and surgical treatment. Management decisions were made by GPs in all but atypical/complex cases Control: Consultant-led one-stop clinic Length of follow-up: 8 months Response and/or attrition rate: 8/89 GPs declined Context (from what/who to what/who): GP to gynaecology	Outcome measures: Outpatient appointments Clinical outcomes Patient views	Main results: At 8 months there were no significant differences between the groups in terms of surgical and medical treatments of in the use of GP clinic appointments. Significantly fewer hospital outpatient appointments were made in the Bridges group than in the one-stop menstrual clinic ($p < 0.001$) The patient diaries demonstrated a significant improvement in the Bridges group for patient information, ease of access ($p < 0.001$), choice of doctor ($p < 0.002$), waiting time ($p < 0.001$) and less 'limbo' between primary and secondary care ($p < 0.001$)	Reported associations between elements for logic model: Unclear

Junghans 2007[109] Country: UK Study design: RCT Data collection method Aim: The effect of patient-specific ratings vs. conventional guidelines on appropriate investigation of angina Detail of participants (number, any reported demographics): *n* = 145 physicians	Method: RCT of 145 physicians receiving patient-specific ratings (online prompt stating whether the specific vignette was considered appropriate or inappropriate for investigation, with access to detailed information on how the ratings were derived) and 147 physicians receiving conventional guidelines from the American Heart Association and the European Society of Cardiology. Physicians made recommendations on 12 web-based patient vignettes before and on 12 vignettes after these interventions Control: Conventional guidelines Length of follow-up: NR Response and/or attrition rate: NR Context (from what/who to what/who): GP referral for angina	Outcome measures: Proportion of appropriate investigative decisions as defined by two independent expert panels	Main results: Decisions for exercise electrocardiography were more appropriate with patient-specific ratings [819/1491 (55%)], compared with conventional guidelines [648/1488 (44%)] (OR 1.57; 95% CI 1.36 to 1.82). The effect was stronger for angiography [1274/1595 (80%) with patient-specific ratings, compared with 1009/1576 (64%) with conventional guidelines (OR 2.24, 95% CI 1.90 to 2.62)] Within-arm comparisons confirmed that conventional guidelines had no effect but that patient-specific ratings significantly changed physicians' decisions towards appropriate recommendations for exercise electrocardiography (55% vs. 42%; OR 2.62, 95% CI 2.14 to 3.22) and for angiography (80% vs. 65%; OR 2.10, 95% CI 1.79 to 2.47) These effects were robust to physician specialty (cardiologists and GPs) and to vignette characteristics, including older age, female sex and non-white race/ethnicity	Reported associations between elements for logic model: Patient-specific ratings result in more appropriate investigations of angina than conventional guidelines

Kennedy *et al.* 2012[106] Country: UK (Scotland) Study design: Retrospective audit Data collection method: Analysis of electronic referral system data over 1 year Aim: To evaluate an electronic referral system Detail of participants (number, any reported demographics): *n* = 190 patients referred with suspected squamous cell carcinoma of the head and neck; 55% female; aged 19 to 92 years; mean age 58 years	Intervention: A fast-track electronic referral system including referral guidelines. Suspected Cancer Urgent Referral Electronically System containing specific alarm symptoms Number of hours: NA Delivered by who? Electronic system Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): From GP to head and neck cancer clinic	Outcome measures: Appropriateness of referral: number of patients referred who were subsequently diagnosed with cancer	Main results: 52% of the urgent referrals required no further investigation following assessment and were discharged Head and neck cancer detection rate (% of patients with confirmed diagnosis from total number of referrals) was 8%. Overall cancer detection rate 15% During the time period of system operation only 14% of the total number of head and neck cancers diagnosed were referred via the electronic system. All others had been referred by non-urgent referral channels (by the same group of practitioners) 27 different GP practices used the system to refer; however, one city-centre practice accounted for 17% of referrals Author conclusion: GP referral guidelines and fast-track clinic did not work, with 86% of patients diagnosed with cancer bypassing the system	Reported associations between elements for logic model: Referral rate disproportionately high for one city-centre practice suggesting a lower threshold to refer Analysis of referral letters revealed disappointing level of compliance with referral guidelines with 12% not mentioning any of the alarm symptoms and many not detailing risk factors Speeding of referral via the system for some patients may have resulted in longer waiting times for other patients

Kerry 2000[59] Country: UK Study design: RCT Data collection method: All doctors were sent a questionnaire about the guidelines Aim: To see if the introduction of radiological guidelines into general practices together with feedback on referral rates reduces the number of GP radiological requests over 1 year; and to explore GP attitudes to the guidelines Detail of participants (number, any reported demographics): 69 practices	Intervention: In February 1995 a GP version of the RCR guidelines was sent to each GP in the 33 practices in the intervention group. After 9 months' intervention, practices were sent revised guidelines with individual feedback on the number of examinations requested in the past 6 months. The total number of requests per practice was compared for the year before and the year after the introduction of the guidelines Guidelines for examination of chest, hips, knees, spine, skull and sinuses were printed verbatim on two sides of a sheet of A4 paper, which was then laminated Number of hours: NA Delivered by who? NA Control: Control practices were sent the guidelines at the end of the study Length of follow-up: 9 months Response and/or attrition rate: GP questionnaire 60% response rate Context (from what/who to what/who): GP referral to radiology for spinal examination	Outcome measures: Referral rates Attitudes to guidelines	Main results: A total of 43,778 radiological requests were made during the 2 years 1994–6 The number of referrals for all spinal examinations fell by 18% in the intervention group, compared with a 2% rise in the control group ($p = 0.05$) Taking requests for the lumbar spine alone, there was a reduction of 15% in the intervention group compared with a rise of 5% in the control group, giving a difference of 20% between the groups (95% CI 3% to 37%) Overall, an 8% reduction in total numbers of radiological requests was observed in the intervention group, compared with a 2% increase in the control group, giving a difference of 10% between the two groups, but this did not achieve statistical significance	Reported associations between elements for logic model: Introduction of radiological guidelines together with feedback on referral rates was effective in reducing the number of requests for spinal examinations over 1 year

Khan 2008[71] Country: UK Study design: Cohort Data collection method: NR Aim: Efficacy of direct GP referral to the hospital respiratory specialist team in the Hot Clinic in avoiding hospital admissions Detail of participants (number, any reported demographics): Data from 173 patients enrolled between 1 January 2007 and 30 June 2007 were studied. Ninety-seven (57%) were men and 75% were either current or ex-smokers	Intervention: Hospital at-home schemes are popular for the management of acute exacerbations of COPD aimed at reducing demand for hospital inpatient beds and promoting a patient-centred approach through admission avoidance GPs and community nurses directly referred patients threatening an acute hospital admission, by fax, for a rapid assessment. The Hot Clinic service operates Monday to Friday, 09:00–16:00 hours. Patients are seen within 24 hours of the receipt of the referral letter. The consultation includes clinical assessment, chest radiograph, laboratory data and a decision whether to treat the patient in the community or to admit to the hospital. The GP would be informed by a returned typed faxed letter the same day Number of hours: NA Delivered by who? The Hot Clinic team is led by the respiratory consultant and assisted by the specialist registrar and respiratory nurse Control: None Length of follow-up: None Response and/or attrition rate: NA Context (from what/who to what/who): Referral from primary care to COPD clinic (respiratory)	Outcome measures: The efficacy of this service was assessed in terms of admission avoidance and the rate of readmission within 1 week and 1 month of the consultation	Main results: 27 patients (16%) were admitted directly from the Hot Clinic and 146 (84%) were treated in the community. Of those 146 patients, nine (5%) were later admitted within 1 week and 12 (7%) were admitted over 1 week to 1 month after the Hot Clinic appointment. Overall, 125 (72%) were thus treated successfully in the community without the need for hospitalisation It is unclear if all would have been hospitalised without the clinic	Reported associations between elements for logic model: Suggests potential effectiveness of a direct GP referral system to the hospital respiratory team in avoiding hospital admissions

Kim 2004[155] Country: USA Study design: Evaluation Data collection method: Telephone/postal interview Aim: To examine the effect of referral management on diabetes care Detail of participants (number, any reported demographics): $n = 6941$; mean age 61 (SD 13) years; 54% female	Intervention: Translating research into Action for Diabetes (TRIAD) was a multicentre study of managed care enrolees with diabetes Prospective referral management consisted of gatekeeping and mandatory authorisation from the management office. Retrospective referral management consisted of referral profiling and appropriateness reviews Control: No referral management strategy Length of follow-up: 1 year Response and/or attrition rate: NR Context (from what/who to what/who): GP to specialist	Outcome measures: Self reported visit to specialist Difficulty in getting referrals (perceived)	Main results: Referral management was commonly used by health plans (55%) and provider groups (52%). In adjusted analysis, there were no associations between any of the referral management strategies and any of the outcome measures	Reported associations between elements for logic model: Referral management strategies did not affect referrals or perceptions of referrals
Kim 2009[98] Country: USA Study design: Cross-sectional Data collection method: Survey web-based Aim: To survey PCPs to assess the impact of electronic referrals on workflow and clinical care Detail of participants (number, any reported demographics): $n = 298$	Method: 18-item, web-based questionnaire to all 368 PCPs who had the option of referring to San Francisco General Hospital Asked participants to rate time spent submitting a referral, guidance of workup, wait times and change in overall clinical care compared with prior referral methods using five-point Likert scales Length of follow-up: None Response and/or attrition rate: Two hundred ninety-eight PCPs (81.0%) from 24 clinics participated Context (from what/who to what/who): Primary care to clinical care	Outcome measures: Practitioner views Referral	Main results: Over half (55.4%) worked at hospital-based clinics, 27.9% at county-funded community clinics and 17.1% at non-county-funded community clinics. Most (71.9%) reported that electronic referrals had improved overall clinical care. Providers from non-county-funded clinics (AOR 0.40, 95% CI 0.14 to 0.79) and those who spent ≥ 6 minutes submitting an electronic referral (AOR 0.33, 95% CI 0.18 to 0.61) were significantly less likely than other participants to report that electronic referrals had improved clinical care	Reported associations between elements for logic model: PCPs felt that electronic referrals improved health-care access and quality; those who reported a negative impact on workflow were less likely to agree

Kim-Hwang 2010[102] Country: USA Study design: Before-and-after Data collection method: Questionnaire Aim: To determine the impact of the e-Referral, compared with paper-based referral, on specialty referral rates Detail of participants (number, any reported demographics): Specialist clinicians, $n = 505$	Intervention: The study was based on a visit-based questionnaire appended to new patient charts at randomly selected specialist clinic sessions before and after the implementation of e-Referrals (using web-based pro forma). A specialist reviewer (physician or nurse) reviews the referrals and determines whether or not it is appropriate to schedule an appointment Control: Paper-based referral Length of follow-up: 2-year study Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Self-reported difficulty in identifying the referral question Referral appropriateness, need for, and avoidability of follow-up visits	Main results: It was difficult to identify the reason for referral in 19.8% of medical and 38.0% of surgical visits using paper based methods vs. 11.0% and 9.5% of those using e-Referral ($p = 0.03$ and $p < 0.001$) Of those using e-Referral, 6.4% and 9.8% of medical/surgical referrals using paper methods vs. 2.6% and 2.1% were deemed not completely appropriate ($p = 0.21$ and $p = 0.03$) Follow-up was requested for 82.4% and 76.2% of medical and surgical patients with paper referrals vs. 90.1% and 58.1% of e-Referrals ($p = 0.06$ and $p = 0.01$) Follow-up was considered avoidable for 32.4% and 44.7% of medical/surgical follow-ups with paper-based methods vs. 27.5% and 13.5% with e-Referral ($p = 0.41$ and $p < 0.001$)	Reported associations between elements for logic model: e-Referral can improve communication and increase the appropriateness of referrals

King 2001[119] Country: UK Study design: Before-and-after Data collection method: Questionnaires and interviews Aim: Whether or not in practices with high referral rate, an invitation to review referrals could identify patients on the waiting list who considered their referral unnecessary, leading to a negotiated cancelling of their appointment Detail of participants (number, any reported demographics): 435 put patient referrals made in 4 months by one general practice with 6600 patients. *n* = 109 eligible for study	Intervention: 4–7 weeks after referral, selected patients were sent a questionnaire and an invitation to a review appointment Exclusion criteria were symptoms which raise the possibility of significant disease; patient's mental state precludes consent or co-operation; the referring doctors prefers the patient not to participate; such urgency that an outpatient appointment could be expected within 3 weeks Subsequently, a series of 22 semistructured interviews were undertaken to seek the review of patients on their willingness to review the referral decision Number of hours: NA Delivered by who? GP Control: NA Length of follow-up: NA Response and/or attrition rate: 109 of 435 referrals Context (from what/who to what/who): GP referral to any specialty	Outcome measures: Outpatient appointment cancellation	Main results: Of 435 referrals, 109 (25%) were eligible for this study. 77 (72%) responded to the questionnaire and of those, 10 (13% of responders) indicated uncertainty that referral was still needed Eight of these attended for review, but in none of these cases was the appointment subsequently cancelled Therefore, taking cancellation of hospital appointment as an end point, the effect shown is 0 out of 435 referrals and 0 out of 109 in the intervention group (95% CI for 0 out of 109 = 0% to 3%)	Reported associations between elements for logic model: Referral review is not an effective way to detect avoidable referrals or enable negotiated cancelling of outpatient referrals

Knab 2001[112] Country: USA Study design: Before-and-after Data collection method Aim: To determine whether or not CBDS could enhance the ability of primary care physicians to manage chronic pain Detail of participants (number, any reported demographics): 100 chronic pain patients	Intervention: Structured summaries were generated for 50 chronic pain patients referred by primary care physicians to a pain clinic. A pain specialist used a decision support system to determine appropriate pain therapy and sent letters to the referring physicians outlining these recommendations. Separately, five board-certified primary care physicians used a CBDS system to 'treat' the 50 cases. A successful outcome was defined as one in which new or adjusted therapies recommended by the software were acceptable to the primary care physicians (i.e. they would have prescribed it to the patient in actual practice). Two pain specialists reviewed the primary care physicians' outcomes and assigned medical appropriateness scores (0 totally inappropriate to 10 totally appropriate). One year later, the hospital database provided information on how the actual patients' pain was managed and the number of patients rereferred by their primary care physician to the pain clinic Control: None Length of follow-up: 1 year Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for chronic pain	Outcome measures: Appropriateness Rereferral	Main results: On the basis of CBDS recommendations, the primary care physician subjects 'prescribed' additional pain therapy in 213 of 250 evaluations (85%), with a medical appropriateness score of 5.5 ± 0.1. Only 25% of these chronic pain patients were subsequently rereferred to the pain clinic within 1 year	Reported associations between elements for logic model: The use of a CBDS system may improve the ability of PCPs to manage chronic pain and may also facilitate screening of consults to optimise specialist utilisation

Knol 2006[90] Country: the Netherlands Study design: Before-and-after Data collection method: Referral data/interviews Aim: To reduce dermatology referrals Detail of participants (number, any reported demographics): $n = 505$ consultations by 29 GPs	Intervention: One overview and two detailed digital photographs of the skin problems were taken on a digital camera and attached to an e-mail message containing standard clinical information. The e-mail was sent to a dermatologist who replied after evaluation. After a median follow-up of 548 days, GPs were interviewed about dermatology referrals Control: NA Length of follow-up: 2 years Response and/or attrition rate: follow-up data not available for 32 (6%) patients Context (from what/who to what/who): GP to dermatology	Outcome measures: Referral rate	Main results: Patients were split into those who GPs would have referred without the intervention ($n = 306$) and those who they would not have referred Using teledermatology, 163 patients were not referred, a reduction of 163/306 or 53% There was no significant difference between dermatologist for secondary referral ($\chi^2 = 1.6$, $p = 0.45$). Patient gender did not affect secondary referral ($\chi^2 = 0.8$, $p = 0.36$) When GPs had no prior intention to refer, there turned out to be a secondary consultation in 17% of cases (24/136) Older patients were more likely to be referred ($\chi^2 = 10.6$, $p < 0.01$)	Reported associations between elements for logic model: The 51% referral reduction was similar to other studies of videoconferencing

Kousgaard 2003[29] Country: Denmark Study design: RCT (unblinded) Data collection method: Questionnaires Aim: To investigate GP assessment of a structured oncology information pack sent to GPs when newly referred patients had visited a department of oncology for the first time, and to compare their assessment of this material with their assessment of traditional information provided by the department Detail of participants (number, any reported demographics): 248 cancer patients and their 199 GPs	Intervention: Intervention group practitioners received a structured information pack when their patients attended the department of oncology for the first time. The patients were informed that their GP would receive this information and thus the study was unblinded. The pack included (1) a discharge letter written in accordance with specially developed guidelines and bearing the direct telephone number of a departmental contact person, (2) information about the cancer, its treatment and prognosis, (3) general information about radiotherapy and chemotherapy and treatment of nausea and sickness and (4) information that the patient had been advised to see his/her own practitioner about problems and question Control: Participating practitioners in the control group received the traditional information from the department (i.e. the discharge letter or an extract from the hospital record) Length of follow-up: NR Response and/or attrition rate: 88.3% of the 248 questionnaires were returned Context (from what/who to what/who): GP referral to oncology	Outcome measures: Practitioner views GP assessment of the quality of the information material received for each patient	Main results: The structured information pack improved GP knowledge of oncology; GPs found themselves better equipped to support and counsel patients during the course of their illness, and practitioner satisfaction with the department rose GP evaluations of the first discharge letter received from the department. The two groups were significantly different ($p = 0.039$): Intervention group practitioners gave a significantly higher score to the information value of the discharge letter than did control group practitioners. The most pronounced difference was seen for psychosocial conditions ($p = 0.001$) and information about what the patient had been told at the department ($p = 0.001$). Stratification according to sex, years as a GP and practice location revealed no differences between the groups (data not shown)	Reported associations between elements for logic model: Intervention, though reasonably simple, inexpensive and not particularly time-consuming, improved co-operation between the specialist department and the GP

Lam 2011[25] Country: UK/China Study design: Cross-sectional Data collection method: Questionnaire (postal) Aim: To examine the outcomes of a postgraduate training course in geriatrics for primary care doctors Detail of participants (number, any reported demographics): $n = 98$	Method: An evaluative study was conducted to examine the impact of the Postgraduate Diploma in Community Geriatrics, which is a 1-year part-time program for primary care doctors developed by the Family Medicine Unit of The University of Hong Kong The diploma includes the components of clinical attachment (20 sessions of clinical geriatric teaching and five sessions of rehabilitation and community health services), interactive workshops, locally developed distance-learning manual, written assignments and examination as well as a clinical examination Control: NA Length of follow-up: NA Response and/or attrition rate: Ninety-eight replies were received with a response rate of 52.4% (98/187) Context (from what/who to what/who): GP referral to geriatrics	Outcome measures: Referral Views on training	Main results: Most respondents felt it was more rewarding and had participated more in geriatric care, and the majority had improvement in their communication skills with elderly patients after taking the course. Moreover, the graduates are more confident in diagnosing and managing common geriatric problems, and deciding to which specialty to refer the elderly patients Of the referrals, there was a significant increase to private geriatricians and a significant reduction to other specialists. The average number of elderly patients seen per day had also increased However, little change was observed about making nursing home visits, the frequency of which remained low. Many graduates expressed difficulties in conducting nursing home visits	Reported associations between elements for logic model: Education can affect referral and confidence

Leggett 2004[85] Country: UK Study design: RCT Data collection method: NR Aim: To compare outcomes of referral for dermatology appointments between patients whose referral letters do or do not include instant photograph(s) Detail of participants (number, any reported demographics): $n = 136$ (20 GPs: 10 intervention and 10 control)	Intervention: Instant photographs, taken by the GP, were included in the referral letters. The GP took photograph(s) of the skin condition and sent them with a referral letter to the dermatologist in a numbered, sealed envelope. If a diagnosis was not possible, patients were given an appointment. If diagnosis was possible, a letter was sent to the GP with advice on management: some patients were also given an appointment for further management Number of hours: GPs were trained for 15 minutes to use a camera to produce digital photos of the presenting condition Delivered by who? NA Control: Control group patients were given outpatient appointments in the usual way Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GP to dermatology	Outcome measures: The numbers of study group patients needing an appointment for diagnosis or management and with a changed diagnosis after face-to-face consultations were recorded Waiting time from referral to appointment or management plan was recorded for both groups	Main results: For 63% of the study group (45/71), a diagnosis and a management plan were made without the patient requiring an appointment. This included 38% (27/71) who, after diagnosis and initial management, needed an appointment and 25% (18/71) who did not The remainder of the study group (37%; 26/71) required a face-to-face consultation The mean time for formulation of a management plan for patients without an appointment was 17 days (SD = 11); waiting times for appointments in study and control groups were similar (mean 55 days; SD = 40)	Reported associations between elements for logic model: Instant photography is helpful in managing dermatology referrals and offers the potential to reduce numbers requiring an outpatient appointment by 25%

Leiba 2002[130] Country: Israel Study design: nRCT Data collection method Aim: Evaluation of easy-to-access to specialists on health service use, cost (time and money) and GP attitude Detail of participants (number, any reported demographics): None	Intervention: A specialist outreach clinic was established in a home-front military primary care clinic. Patients were referred to nearly by specialists but no further referral was required for continuity of specialist care The same analysis was applied to a similar clinic employing only GPs, which refers to military specialist centres or hospital outpatient clinics Number of hours: NA Delivered by who? NA Control: No outreach clinic Length of follow-up: 6 months Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to specialist outreach clinic or usual hospital care	Outcome measures: Health service use, cost (time and money) and GP attitude	Main results: The incorporation of specialists did not result in a significant increase in the overall consumption of medical services ($p < 0.05$). It reduced the number of referrals out of the clinic to specialist centres from 1449 to 421 per month ($p < 0.05$). In the control clinic, referrals to distant specialist centres and outpatient clinics showed a slight and non-significant increase Loss of work days was reduced from 2891 days per month to 1938 days per month ($p < 0.001$) The total cost of all medical interactions and referrals did not significantly increase after the introduction of the outreach specialist clinic ($p < 0.05$). Primary physicians graded their satisfaction with the new clinic as 4.5 (out of 5)	Reported associations between elements for logic model: Improving access to specialists geographically and removing the need for a referral for each specialist visit did not increase total health-care use and costs

Lester 2009[39] Country: UK Study design: cRCT Data collection method: NR Aim: To assess the effect of an educational intervention for GPs on referral rates to early-intervention services and the duration of untreated psychosis for young people with first-episode psychosis Detail of participants (number, any reported demographics): A total of 110 of 135 eligible practices (81%) were recruited. 179 young people were referred: 97 from intervention and 82 from control practices	Intervention: REDIRECT trial (BiRmingham Early Detection In untREated psyChosis Trial) Practices with access to the three early-intervention services in three inner-city PCTs in Birmingham were eligible for inclusion. Intervention practices received an educational intervention addressing GP knowledge, skills and attitudes about first-episode psychosis. The outcome of the theoretical and modelling work suggested that the educational intervention needed to impart knowledge about important symptoms and signs evident in first-episode psychosis, teach core questioning skills, and encourage more positive attitudes towards young people with the condition A 17-minute video made specifically for the study, depicting role-played primary care consultations with young people with first-episode psychosis, was shown to GPs in intervention practices. The study team then led a 15-minute question-and-answer session including referral guidelines to early-intervention services. Two refresher educational sessions were conducted Number of hours: NR Delivered by who? NR Control: no intervention Length of follow-up: Follow-up at 4 months Response and/or attrition rate: NR Context (from what/who to what/who): Referral from general practice to psychiatry	Outcome measures: Difference in the number of referrals to early intervention services between practices Duration of untreated psychosis Time to recovery Use of the Mental Health Act, and GP consultation rate during the developing illness	Main results: Ninety-seven people with a first episode of psychosis were referred by intervention practices, and 82 people from control practices during the study: RR of referral 1.20 (95% CI 0.74 to 1.95, $p = 0.48$) No effect was observed on secondary outcomes except for 'delay in reaching early-intervention services', which was statistically significantly shorter in patients registered in intervention practices (95% CI 83.5 to 360.5, $p = 0.002$)	Reported associations between elements for logic model: GP training on first-episode psychosis is insufficient to alter referral rates to early-intervention services or reduce the duration of untreated psychosis

Levell 2012[129] Country: UK Study design: Before-and-after study Data collection method: Standard hospital systems Aim: To assess the effect of introducing dermatology integrated intermediate-care services on the numbers of dermatology referrals to secondary care Detail of participants (number, any reported demographics): None	Method: The dermatology intermediate care service was set up in 2005, providing services in two locations by two GPwSIs in dermatology. The GPwSIs were supported by experienced dermatology nurses and in total six clinics weekly were held, seeing approximately 30 new patients weekly Control: None (before-and-after) Length of follow-up: 2004–10 Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to dermatology	Outcome measures: Dermatology new patients	Main results: The numbers of dermatology new patients seen, which had been stable for 5 years, showed an increase in 2007 followed by a substantial increase in 2008 and then 2009 The mean number of new patients seen in dermatology in 2004–6 was 6927 patients per year; in 2007, 7844 patients; and the mean number of new patients seen between 2008 and 2010 was 11 535 patients per year. This was an increase of 67% in the number of new patients seen. Overall, over this period, there was a 23% increase in dermatology new patients seen in secondary care dermatology in England	Reported associations between elements for logic model: The introduction of dermatology intermediate care services was followed by a 67% increase in secondary care new patients
Lucassen 2001[45] Country: UK Study design: Before-and-after Data collection method: NR Aim: To see whether or not guidelines on whom to refer to a regional genetics service could improve appropriateness of referrals Detail of participants (number, any reported demographics): NR	Intervention: Referral guidelines for ORGS family cancer clinic were drawn up in discussion with local GPs, surgeons, radiologists, gynaecologists, public health physicians and geneticists. Evidence from national consensus was incorporated where available. The guidelines were sent to all Oxfordshire GPs and subsequent content of referral letters was analysed. A retrospective analysis of referral letters sent during the previous 6 months was also made Number of hours: NA Delivered by who? NA Control: NA Length of follow-up: 8 months Response and/or attrition rate: NA Context (from what/who to what/who): GP to regional genetics service	Outcome measures: Appropriate referral	Main results: Post guidelines, more referrals met the criteria than before ($\chi^2 = 15.79$, $p < 0.001$) Fewer lower-risk referrals were made: 34% of letters (36/103) were high risk pre guidelines, whereas 47% (46/110) were high risk post guidance (not significant: χ^2 for change in proportion of low risk pre and post = 1.34, $p = 0.24$, and for high risk = 3.33, $p = 0.07$), and that the description of the risk in the GP letter improved so that a greater proportion of generic clinic risks agreed with those described in the GP letter	Reported associations between elements for logic model: The use of referral guidelines can improve appropriateness of referrals to secondary care (regional genetic screening service)

DOI: 10.3310/hsdr03240

Lyon 2009[160] Country: UK Study design: Before-and-after Data collection method: GP data Aim: To promote the early presentation and diagnosis of breast, bowl and lung cancer Detail of participants (number, any reported demographics): NR	Intervention: Involving local people working in partnership in their communities to raise awareness of cancer symptoms and promote early presentation. The teams work with primary care, other statutory organisations and with the voluntary sector. The specific contribution of the local people was in the identification of hard-to-reach groups and the tailoring of effective health messages Number of hours: NR Delivered by who? Local people and primary care Control: NA Length of follow-up: 1 year Response and/or attrition rate: NA Context (from what/who to what/who): GP to cancer screening	Outcome measures: Referrals	Main results: Interim results show an increase in the number of urgent 2-week referrals and the proportion of new cancer cases diagnosed through the urgent 2-week referral route (from 43% to 51%) for all three cancers. These results were statistically significant for the bowel cancer ($\chi^2 = 22.193$, df = 1; $p < 0.001$) and lung cancer pathways ($\chi^2 = 8.886$, df = 1; $p = 0.003$). There was also an increase in the proportion with no spread at the time of diagnosis for bowel cancer (38–43%) and breast cancer (41–44.5%), but these results did not reach statistical significance	Reported associations between elements for logic model: Community awareness raising led to an increase in 2-week cancer referrals

Maddison 2004[154] Country: UK Study design: Before-and-after Data collection method Aim: Impact of the targeted early access to musculoskeletal services (TEAMS) programme on accessibility to musculoskeletal services Detail of participants (number, any reported demographics): No information	Intervention: Establishing with central clinical triage a common pathway for all musculoskeletal referrals so that patients attend the appropriate department A back pain pathway led by extended scope physiotherapists was developed, and GPwSIs and extended scope physiotherapists were trained to provide services for patients with uncomplicated musculoskeletal problems in the community Control: NA Length of follow-up: 18 months Response and/or attrition rate: NA Context (from what/who to what/who): GP to musculoskeletal	Outcome measures: Number of patients referred and seen with musculoskeletal problems, waiting times, number of duplicate referrals, and surgery conversion rates in orthopaedic clinics	Main results: After the introduction of the targeted early access to musculoskeletal services in April 2002, there was a major increase (116%) in the total number of referrals for musculoskeletal problems. In contrast, the number of orthopaedic referrals was slightly reduced Over 18 months the total number of referrals more than doubled. Despite this, waiting times for musculoskeletal services fell; this was noticeable for rheumatology and pain management (primary data not given) Duplicate referrals were abolished. Surgery conversion rates did not, however, change The community musculoskeletal clinics were well received by GPs, and the short waiting time of 4–6 weeks put them in demand. Patients were generally seen on a one-off basis; < 10% were referred on or followed up. Patient satisfaction questionnaires showed that 88% of patients rated the service as excellent or good, and 75% were completely satisfied with the service provided	Reported associations between elements for logic model: Community-based multidisciplinary clinics run by specially trained GPwSIs and extended scope physiotherapists are an effective way of managing patients with uncomplicated musculoskeletal problems and have been well received by patients and GPs

Magill 2009[115] Country: USA Study design: Before-and-after Data collection method: Analysis of referral rate data Aim: To evaluate a computer-based system to enhance referral for colonoscopy Detail of participants (number, any reported demographics): Patients aged 50 years or older with no record of having a colonoscopy in last 10 years. No detail of staff characteristics beyond description of outpatient practices varying in size, with smallest having two physicians and largest having 25	Intervention: 1. Pop-up prompt for screening colonoscopy on EMR modified 2. Also education sessions for primary care providers comprising epidemiology of colon cancer, strategies for early detection, how to use EMR and optimal clinic workflow to facilitate screening 3. Medical assistants asked to discuss screening with eligible patients before seen by physician and initiate preliminary order for test + best practice alerts, computerised documentation of referral status, individual physician feedback implemented later Number of hours: No detail of how long/ many education sessions Delivered by who? NR Control: None Length of follow-up: Baseline January 2003, intervention through to July 2007 (4 years) Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to colonoscopy service	Outcome measures: Colonoscopy referral rate	Main results: Individual site providers experienced very different local conditions and changes during the course of the project (e.g. relocation, new services, personnel change, introduction of revenue for screening site and physician from referrals) At baseline monthly referral rates 5–7% Pop-up prompt and provider education introduced over 2-month period showed little or no immediate correlation Initiation of MA workflow change 2 months later was associated with 11% increase in referral rate. Following 29 months all had referral rates above the baseline point ($p < 0.001$) Small increases observed after best practice alerts and computerised documentation of referral status implemented 2.5 years after initial intervention (no details of these intervention methods). Also small increases after unblinded individual physician feedback implemented 3 years later At 4-year point referral rates remained above baseline Wide variation in performance between providers, even those practising in the same clinic. Improved performance data mostly due to performance at the two largest clinics	Reported associations between elements for logic model: Physicians responded differently to the interventions. Of those who did respond initially many did not sustain improvement and reverted to baseline Only a few demonstrated improvement trend over longer than 9 months Different local conditions and aggregated data masking individual differences between clinicians

Malik 2007[41] Country: UK Study design: Audit Data collection method: Patient records/referral letters Aim: To determine if the 2-week wait referral guidelines had been followed, and what proportion of patients referred under the guideline had malignant tumours Detail of participants (number, any reported demographics): 40 patients	Intervention: Referral letters were evaluated to see if they met Department of Health guidelines for referral of a suspected bone or soft tissue tumour Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for cancer	Outcome measures: Referral meets guidelines	Main results: 40 patients were referred under the guideline between January 2004 and December 2005. Ten of these patients (25%) had malignant tumours, compared with 243 of 507 (48%) of those referred from other sources Most (31 of 40, 78%) '2-week' referrals met the published referral guidelines. In 9 of the 40 cases, the patient did not meet the criteria for urgent referral. None of the nine patients had malignant tumours	Reported associations between elements for logic model: Unclear
Mariotti 2008[113] Country: Italy Study design: Audit Data collection method: Clinical data Aim: To evaluate a new method of prioritisation of patients suffering from significant GI disorders needing rapid access to diagnostic procedures Detail of participants (number, any reported demographics): $n = 438$ outpatients	Intervention: GPs used a ranking of waiting times for different levels of clinical priority called homogenous waiting groups. Specialists also assigned a priority level for each patient as well as evaluating the appropriateness of the referral and the presence of significant endoscopic disorders. Agreement between GP and specialist was evaluated Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 7 months of intervention data Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Referral priority GP/specialist agreement	Main results: Most referrals (74.4%) were deemed low priority by GPs, with no maximum waiting time assigned. The level of agreement between GPs and specialists as regards patients' priorities was poor to moderate; for gastroscopy the kappa was 0.31, and for colonoscopy 0.44 There was an association between the proportion of significant disorders identified with endoscopy and the priority assigned to the referral ($\chi^2 = 18.9$, 1 df; $p < 0.001$). The overall proportion of referrals deemed inappropriate by specialists was 22.1%	Reported associations between elements for logic model: There is value in liaison between GPs and specialists for achieving timely referrals and avoiding delayed diagnosis. High levels of agreement need to be achieved

DOI: 10.3310/hsdr03240

Matowe *et al.* 2002[50] Country: UK Study design: Before-and-after Data collection method: Admin system data Aim: To evaluate the effect of disseminating guidelines Detail of participants (number, any reported demographics): 376 GPs in 87 practices in Grampian. 117,747 referrals, mostly chest X-rays followed by limb and joint and then spine	Intervention: Copies of Royal College of Radiology guidelines were mailed to GPs Number of hours: NA Delivered by who? NA Control: None Length of follow-up: Data for 3 years Response and/or attrition rate: NA Context (from what/who to what/who): GP to radiography	Outcome measures: Data from two radiology departments – effect of intervention on total number of referrals – absolute change in referral, underlying trend, and change in referral trend Effect on investigations requested average more than 20 times per month	Main results: Month of May had highest number of referrals; December had the lowest No significant effects of intervention on total number of general practice imaging requests. Total referrals decreased by 32 (95% CI –226.7 to + 291.4) in month following guideline dissemination while trend decreased by –1.82 requests per month (95% CI –11.8 to + 8.2). Referral decreased by average 1.2 per month for the entire 35-month period None of 18 examinations evaluated changed significantly after introduction of guidelines on time series analysis. Eleven of the 18 did show significant difference before and after introduction of the guidelines, however, with 10 having significant underlying trends	Reported associations between elements for logic model: No effect of passive distribution of guidelines. Before-and-after studies may erroneously find an effect
McGarry 2009[148] Country: Australia Study design: Evaluation survey Data collection method: NR Aim: To examine changes in patient management and referral for care following the BOiMHC initiative Detail of participants (number, any reported demographics): One hundred and thirty-three (33%) GPs responded	Intervention: Significant government spending has resulted in substantial changes to the Australian primary mental health-care system. Initially producing the BOiMHC initiative, this has been replaced by the Better Access to Mental Health Care programme, which allows all GPs to refer patients for allied psychological health care under BOiMHC. Incentives commenced August 2002. GPs working in accredited practices who had completed accredited mental health training were able to receive service incentive payments (SIP) for providing care to patients with ICD-10-diagnosed mental illness. Trained GPs able to refer patients for psychological therapies to the Access to Allied Psychological Service (ATAPS) via divisions of general practice. GP Psych Support provides GPs with access to advice from psychiatrists via telephone, e-mail or fax	Outcome measures: Referral to mental health care	Main results: The main self-reported strategies for managing patients with depression were similar to the previous study: supportive counselling and medication Compared with the original study, significant differences between rates of formal training (short course, diploma, certificate, degree or work at the level of psychiatry registrar or above) were only found in Institute for Psychological Therapies ($p = 0.03$) and relaxation therapy ($p = 0.03$), with fewer responders reporting formal IPT training (current: 8.6%, 11/128; original: 17.5%, 24/137) and more reporting formal training in relaxation strategies (current: 18.6%, 24/129; original 9.3%, 13/140) in the current study. Otherwise there were no significant differences in rates of formal training	Reported associations between elements for logic model: While GPs' main reported strategies for managing patients with depression were unchanged, reported referral for psychological therapies was significantly higher in 2006, possibly reflecting the impact of changes to the primary mental health-care system

	BOiMHC: Commenced November 2006. All GPs regardless of training or practice location receive higher Medicare rebates to complete GP mental health plans for patients with ICD-10-diagnosed mental illness, as well as higher rebates for mental health consultations. Patients with an ICD-10 diagnosis and a GP mental health plan are eligible for Medicare rebates for psychological care, for up to 12 sessions per year (individual) and 12 sessions (group therapy) This study was a comparison of results of a 2006 postal survey of Australian GPs examining self-reported management of patients with depression with a similar survey conducted in 2001–2, prior to the BOiMHC initiative Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 4 years Response and/or attrition rate: 133 of 410 responded Context (from what/who to what/who): GP referral to mental health care	Significantly higher rates of referral for psychological treatments were reported in 2006 than in 2002. Significantly higher proportions of responders in the current study reported referring half or more of their patients with mild to moderate depression for PST ($p < 0.001$) or cognitive–behavioural therapy ($p < 0.001$). In fact, significantly more responders reported higher rates of referral for most modalities than in the original study

McGowan 2008[107] Country: Canada Study design: RCT Data collection method: Survey Aim: Evaluated whether or not information provided by librarians to answer clinical questions positively impacted time, decision-making, cost savings and satisfaction Detail of participants (number, any reported demographics): Physicians (93.2%; $n = 82$), with a small number of nurse practitioners (4.5%; $n = 4$), residents (1.1%; $n = 1$) and nurses (1.1%; $n = 1$)	Intervention: The 'just-in-time information' librarian consultation service was designed to provide a rapid response to clinical questions during patient visit hours. The questions were submitted by the participants and each question was randomly assigned to the intervention (librarian information) or control (no librarian information) group. If the question was randomised to the control group, participants received a message within 1 minute that their question would not be answered. The librarian still answered the question, but the software blocked the response from being sent to the participant. Thus, they would need to try to answer the question themselves. The object of the randomisation was a clinical question Each participant had clinical questions randomly allocated to both intervention (librarian information) and control (no librarian information) groups. Participants were trained to send clinical questions via a hand-held device Control: No library information Length of follow up: Survey sent 24 hours after a question was submitted Response and/or attrition rate: A total of 110 individuals signed consent forms; 21 of these individuals withdrew from participation before randomisation, leaving a final group of 88 individuals who participated in the RCT Context (from what/who to what/who): GP to specialist	Outcome measures: Impact of the information provided by the service (or not provided by the service), additional resources and time required for both groups	Main results: The average time for 'just-in-time information' librarians to respond to all questions was 13.68 minutes/question (95% CI 13.38 to 13.98 minutes). The average time for participants to respond their control questions was 20.29 minutes/question (95% CI 18.72 to 21.86 minutes) Using an impact assessment scale rating cognitive impact, participants rated 62.9% of information provided to intervention group questions as having a highly positive cognitive impact. They rated 14.8% of their own answers to control question as having a highly positive cognitive impact, 44.9% as having a negative cognitive impact, and 24.8% with no cognitive impact at all In an exit survey measuring satisfaction, 86% (62/72 responses) of participants scored the service as having a positive impact on care and 72% (52/72) indicated that they would use the service frequently if it were continued	Reported associations between elements for logic model: Providing timely information to clinical questions had a highly positive impact on decision-making and a high approval rating from participants

McKoy 2004[89] Country: USA Study design: Before-and-after Data collection method: Clinical data Aim: To evaluate the accuracy, access time, cost and acceptance by patients and physicians of an asynchronous teledermatology referral intervention in primary care Detail of participants (number, any reported demographics): $n = 52$ patients aged 25–89 years. 46% female	Intervention: Primary care physicians in a multispecialty group referred patients for teledermatology consultation. Same-day history and digital images taken by a nurse were electronically sent to a dermatologist who returned a diagnosis to the referring physician Control: NA Length of follow-up: NA Response and/or attrition rate: 52 of 54 enrolled patients completed the study Context (from what/who to what/who): GP to dermatology	Outcome measures: Diagnosis Referral	Main results: History was adequate for diagnosis in 81% of cases; images were adequate in 75% of cases. Accuracy of the teledermatology diagnosis in cases with adequate images was 97%; accuracy for all cases was 92% A dermatology visit was recommended in 26% of cases with adequate images and in 42% of all cases Access time for a teledermatology opinion was 1.9 days, compared with 52 days for a regular dermatology appointment	Reported associations between elements for logic model: Unclear
McNally 2003[74] Country: UK Study design: Retrospective data analysis before and after introduction Data collection method: Examination of case notes Aim: To assess the impact of a fast-track clinic Detail of participants (number, any reported demographics): 295 cases over a 6-year period; patients with primary ovarian cancer. 109 cases prior to intervention and 133 cases after	Intervention: Clinic appointment within 2 weeks to fast-track clinic. Clinical referral criteria. GPs informed of the clinic and referral criteria by individual letter, GP newsletter, and meetings Number of hours: NA Delivered by who? NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Referral for ovarian cancer	Outcome measures: Time to diagnosis	Main results: Median waiting time for referral to specialist was 3 days (range 0–188 days). This did not change significantly after clinic introduction ($p = 0.05$). The impact of fast-track clinic on referral and diagnosis time variables was not significant The fast-track clinic saw 10%, 20.1% and 10.3% of ovarian cancers diagnosed by the service during the first 3 years of operation. 13.5% of patients were referred to the fast-track clinic	Reported associations between elements for logic model: Rapid access clinic may have some limited impact but may be underused

Melia *et al.* 2008[51] Country: UK Study design: Before-and-after Data collection method: Request for GP data, data from pathology labs Aim: To evaluate whether or not guidelines for GPs impacted on GP referral for potential prostate cancer screening Detail of participants (number, any reported demographics): GPs referring to pathology lab in four study areas (Chichester, Sutton, Truro and York). 200 GP partners in 48 practices. Male patients aged 45–84 years, $n = 1520$	Intervention: Prostate Cancer Risk Management Programme (guidelines for GPs on age-specific prostate-specific antigen cut-off levels in asymptomatic men) Number of hours: NA Delivered by who? NA Control: None Length of follow-up: 1–2 years pre intervention to post Response and/or attrition rate: 48 of 69 practices invited took part (70%), 79% of patients' baseline data, 90% at intervention Context (from what/who to what/who): GP to urologists	Outcome measures: GP demographics Awareness of receiving guidelines pack Proportion of asymptomatic men with raised antigens referred to urologists	Main results: Awareness of pack acknowledged by 112 (56%) of GPs, 24 unaware, 64 did not know. Awareness not significantly different by area, age, gender, MRCGP registration, number of years working or number of sessions per week of GP Proportion of asymptomatic men referred who had raised antigen levels did not increase significantly from baseline to intervention (24% pre intervention, 29% post $p = 0.42$). No significant difference in referral rate by area ($p = 0.33$)	Reported associations between elements for logic model: Influence of guidelines low

Morrison 2001[64] Country: UK Study design: RCT Data collection method: GP report of management before referral, hospital record review Aim: To evaluate the effect of clinical guidelines on the management of infertility Detail of participants (number, any reported demographics): 214 GP practices in Glasgow, stratified by small, medium and large practices and by catchment area. 689 referrals; most aged over 34 years, Carstairs deprivation 6/7; 84% female only	Intervention: Local guidelines developed. Management pack sent to intervention practices and invitation to attend a meeting to discuss. 17% of doctors attended a meeting. Individual visits also offered, taken up by two practices Number of hours: NA Delivered by who? NA Control: Delayed intervention, practices received guidelines 1 year later Length of follow-up: Referral letters screened for 1 year Response and/or attrition rate: Seven practices (4%) withdrew, 84% provided pre-referral management information, case notes available for 90% Context (from what/who to what/who): GP to outpatient infertility clinic	Outcome measures: Time presentation to referral Investigations completed by GP Number and content of outpatient visits Time to reach management plan Cost of referral	Main results: No difference control and intervention in regard to whether a management plan was made (OR 1.239, 95% CI 0.869 to 1.765; $p = 0.236$) No difference in duration between first appointment and date of management plan, no difference mean number of outpatient visits before a management plan put in place Intervention practices had a significantly higher mean of total number of investigations carried out before referral (2.81 intervention vs. 2.50 control, OR 1.32, 95% CI 1 to 1.75; $p = 0.05$) No significant difference in total costs to the NHS (£349.78 vs. £327.48, $p > 0.05$) Author conclusion: No evidence that subsequent hospital management was influenced by more investigations by GPs prior to referral	Reported associations between elements for logic model: Simple dissemination of guidelines is unlikely to result in changed referral patterns

Nicholson 2006[97] Country: Australia Study design: Survey data evaluation of intervention – Brisbane e-referral project Data collection method: Survey of GPs, patients, specialists Detail of participants (number, any reported demographics): Six patients and 19 GPs from five practices took part in the intervention. Survey given to eight who had referred patients and 11 who had been trained in using the system	Intervention: Brisbane e-referral project. E-referral and booking appointment system from GP to a hospital outpatient department for patients with suspected cancer. Referral document was attached to the appointment booking slot Control: None Length of follow-up: None Response and/or attrition rate: Context (from what/who to what/who): GP to a hospital outpatient department for patients with suspected cancer	Outcome measures: Likert scale responses 1 strongly disagree, 5 strongly agree, neutral 3	Main results: GP satisfaction high – Saved me time in referring mean 3.75 (SD 1.612) Contributed to feeling of increased trust between hospital and community mean 3.88 (0.885) Given me improved referral template 3.75 Provided useful guideline 4.19 Reduces test duplication for patient 4.13 Makes best use of professional time 3.88 Delivers best patient care 4.13 Improves the timeliness of outpatient bookings 4.62	Reported associations between elements for logic model: Trust Staff time Information sharing Test results Patient satisfaction

Increased confidence referral being auctioned 4.50

Made the referral process easy for patients 4.62

Made little difference to booking appointment 1.75

Improved the quality of information sharing 3.88

Patient satisfaction –

Understood what was planned for my care at all times 4.5

Believe necessary information was transferred 4.75

Needed to have tests repeated 2.67

Sometimes anxious not knowing if had appointment 3.17

Nielsen 2003[92] Country: Denmark Study design: RCT Data collection method: Questionnaire Aim: To determine the effect of a shared care programme on the attitudes of newly referred cancer patients towards the health-care system and their health-related quality of life and performance status, and to assess patients' reports on contacts with their GP Detail of participants (number, any reported demographics): 248 consecutive cancer patients recently referred to the department	Intervention: RCT in which patients completed questionnaires at three time points. The shared care programme included transfer of knowledge from the oncologist to the GP, improved communication between the parties, and active patient involvement Control: The intervention was compared with the normal procedure in the department Length of follow-up: 3 and 6 months Response and/or attrition rate: Sixteen patients refused to participate because they felt they could not manage to fill in the questionnaires and we failed to include eight patients. Two patients were excluded after randomisation because they did not meet the inclusion criteria Context (from what/who to what/who): GP referral for cancer	Outcome measures: Patients' attitudes towards the health-care services, their health-related quality of life, performance status and reports on contacts with their GPs	Main results: The shared care programme had a positive effect on patient evaluation of co-operation between the primary and secondary health-care sectors. The effect was particularly significant in men and in younger patients (18–49 years) who felt that they received more care from the GP and were left less in limbo Young patients in the intervention group rated the GP's knowledge of disease and treatment significantly higher than young patients in the control group. The number of contacts with the GP was significantly higher in the intervention group The European Organisation for Research and Treatment of Cancer quality of life questionnaire and performance status showed no significant differences between the two groups	Reported associations between elements for logic model: Unclear

Patterson 2004[104] Country: UK Study design: Cohort Data collection method: NR Aim: To determine whether or not an e-mail triage system between GPs and a neurologist for new outpatient referrals is feasible, acceptable, efficient, safe, and effective Detail of participants (number, any reported demographics): Seventy-six consecutive patients with neurological symptoms from nine GPs, for whom a specialist opinion was deemed necessary Seventy-six referrals were received for 75 patients in a 14-month period (27 male, 48 female, mean age 44 years, range 16–80 years)	Intervention: A structured form was devised for GPs to refer patients. This set out the required history and examination and was either sent as an e-mail attachment or incorporated in the body text of the e-mail When the neurologist received the e-mail referral he decided if advice alone was appropriate, if investigations were needed or if a clinic visit was necessary. When the investigation results were available, either a clinic appointment was made or further advice was given Control: Conventional consultation Length of follow-up: 6 months Response and/or attrition rate: NA Context (from what/who to what/who): GP to neurology	Outcome measures: The number of participants managed without clinic attendance and the reduction in neurologist's time compared with conventional consultation	Main results: Forty-three per cent of participants required a clinic appointment, 45% were managed by e-mail advice alone, and 12% by e-mail plus investigations GP satisfaction was high Forty-four per cent of the neurologist's time was saved compared with conventional consultation: total time spent was, therefore, 1270 minutes (mean of 16.7 minutes per patient) No deaths or significant changes in diagnosis were recorded during the 6-month follow-up period	Reported associations between elements for logic model: E-mail correspondence between a GP and a neurologist enables the majority of patients to be dealt with within 3 days of referral, enables 57% of those referred to be given advice or have investigations arranged without entering the hospital clinic system and reduces the time of the neurologist by 44%

Pfeiffer 2011[138] Country: USA Study design: Retrospective analysis of clinic data Data collection method: Analysis of hospital patient data from locations with primary mental health services and those without over a 1-year period Aim: To determine whether or not implementation of primary care mental health services is associated with differences in specialty mental health clinic use Detail of participants (number, any reported demographics): 49,957 primary care patients with new visits to specialty mental health clinics. Mean age 55.7 years, male 93%. 118 primary care facilities offering specialist mental health services and 142 without	Intervention: Veterans Health Administration, primary care mental health services providing collocated collaborative mental health specialists and managers screening and managing common mental health conditions (depression, alcohol misuse, PTSD) Number of hours: NA Delivered by who? NA Control: Primary care facilities not having an integrated mental health service Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Primary care services to specialty mental health care	Outcome measures: New visits to specialty mental health clinics Mental health diagnosis Illness severity	Main results: Initiation of treatment at specialty mental health clinic did not differ between primary care with mental health facilities and those without the service (5.6% vs. 5.8%) Attendance at a primary care service for mental health was not a predictor of total number of specialist mental health clinic visits Author conclusion: provision of primary care mental health service not associated with differences in new use of specialty mental health services or diagnoses received	Reported associations between elements for logic model: No impact on referrals from primary care mental health service to specialist service

Potter 2007[46] Country: UK Study design: Prospective cohort study Data collection method: Standard data collection sheets that were completed at the time of consultation and diagnosis Aim: To investigate the long-term impact of the two week wait rule for breast cancer on referral patterns, cancer diagnoses and waiting times Detail of participants (number, any reported demographics): All patients referred to breast clinic from primary care between 1999 and 2005 Over the 7 years, the centre received 24 999 new referrals from primary care, a mean annual referral rate of 3571 (SD 182)	Intervention: Uses routine data to consider the effect of the introduction of the 2-week wait guideline Control: None Length of follow-up: 7 years Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for breast cancer	Outcome measures: Number, route, and outcome of referrals from primary care and waiting times for urgent and routine appointments	Main results: The annual number of referrals increased by 9% over the seven years from 3499 in 1999 to 3821 in 2005, a significant increase of 1.6% (95% CI 1.0% to 2.2%) The number of 2-week wait referrals increased by 42% ($n = 739$) from 1751 in 1999 to 2490 in 2005, an estimated increase of 5.8% per year (5.0% to 6.7%, $p = 0.001$). By contrast, the number of routine referrals has declined over the same period by an estimated 4.3% per year (3.3% to 5.2%, $p < 0.001$), giving an apparent reduction of 24% ($n = 417$) from 1999 to 2005 The percentage of patients diagnosed with cancer in the 2-week wait group decreased from 12.8% (224/1751) in 1999 to 7.7% (191/2490) in 2005 ($p < 0.001$), while the number of cancers detected in the 'routine' group increased from 2.5% (43/1748) to 5.3% (70/1331) ($p < 0.001$) over the same period. About 27% (70/261) of people with cancer are currently referred in the non-urgent group. Waiting times for routine referrals have increased with time	Reported associations between elements for logic model: The 2-week wait rule for breast cancer is failing patients. The number of cancers detected in the 2-week wait population is decreasing, and an unacceptable proportion is now being referred via the routine route

Prades 2011[75] Country: Spain Study design: Mixed method, retrospective data analysis + qualitative Data collection method: Analysis of seven fast-track hospital monitoring indicators + interviews with health professionals administrators Aim: To analyse the implementation and effectiveness of a fast-track referral system for cancer Detail of participants (number, any reported demographics): Data from 56,020 patients referred to 18 fast-track breast, lung or colorectal cancer clinics over a 3-year period. 83 health professionals from 18 fast-track clinics, 38% GPs, 22% clinical lead, 16% medical director, plus clinicians, nurse case managers, secretaries	Intervention: Cancer fast-track programme – 'circuits' that would foster rapid coordination of the process of referral to a rapid diagnosis unit at a teaching hospital in each region Included clinical criteria (referral guidelines) for primary care referral and patient pathway management in hospital. Described as any process having a systematic approach which seeks to synchronise clinical needs by implementing passive (e.g. slots for diagnostic tests) or active measures (e.g. case management) leading to improved co-ordination Number of hours: NA Delivered by who? Staff in hospital Control: None Length of follow-up: None Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to hospital and intrahospital referral. Referrals could come via primary care route or emergencies or other clinical departments	Outcome measures: Waiting time from detection of suspected cancer in primary care to start of initial treatment Categorisation of waiting times – over 30 days, 30 to 45 days, over 45 days Participant views on fast-track programmes	Main results: Increase in completeness of hospital data during intervention period – 74% to 96% indicating degree to which programme had been implemented increased. Adherence to clinical criteria for including patients in fast track system was more than 70% (no specific data). About half of all new patients were diagnosed via the fast track. Cancer rate declined during the period. Mean time to treatment from primary care was 32 days for breast, 30 days for colorectal, 37 days for lung cancer No data for patients not referred via the programme to compare. No data on time to treatment prior to the programme being implemented to compare No qualitative data included, poorly reported. Description of professionals fearing overuse of system; however, this had not happened. One hospital was reported to have been overwhelmed with overindicated colorectal referrals. Professionals reported important to have length of the process clearly indicated. Poor feedback from the clinic to the referrer. 13 clinics had instituted 'case management' systems where nurses were case managers and acted as gatekeepers and reference points for a patient throughout the process Top-down systems where hospital managers design programmes or clinicians lead process of change limit spread of knowledge of guidelines and intrareferral mechanisms. Participatory strategies where a leader is appointed and implementation committee set up ensured an integrated development. Also common circuit across the three types of cancer could create disparity in implementation	Reported associations between elements for logic model: Importance of implementation system Case manager system was effective, also integrated development approaches Half of patients referred via system, half not

Ramsay 2003[27] Country: Canada Study design: Follow-up to RCT Data collection method: Further analysis of trial data in form of referral record analysis Aim: To further examine the effect of educational reminders on radiology referrals – do the effects vary by time period Detail of participants (number, any reported demographics): 40 control and 41 intervention practices, 1424 control referrals and 920 intervention referrals	Intervention: Educational reminder message based on national guidelines added to the report of every radiograph ordered Original trial also had second intervention arm – audit and feedback to individual GPs at the start of the intervention and 6 months later. Practice level information relating to number of requests at each practice compared to all practices in the study was included in the audit. This arm not included in this additional analysis Number of hours: NA Delivered by who? NA Control: No intervention Length of follow-up: 12 months' intervention period Response and/or attrition rate: 66% of control and 67% of intervention practices who participated in original study Context (from what/who to what/who): Radiology referrals (knee and lumbar spine radiographs)	Outcome measures: Change in monthly total number of referrals for knee and lumbar spine radiographs per GP practice (adjusted for practice size)	Main results: Previous study had found audit and feedback (arm 2) had led to a non-significant reduction of around 1% in radiograph requests. Educational reminder messages led to a statistically significant relative reduction of about 20% in radiograph requests. These figures were means across the intervention period Current analysis – number of knee radiograph referrals in intervention group was consistently below that of control group across the study period. Absolute mean reduction in referrals per month of 1.1 in intervention group. A similar pattern was observed in the lumbar spine radiograph referrals Evidence of seasonal variation. After adjusting for this – knee radiographs RR reduction = 0.65 and RR lumbar spine radiographs = 0.64. No decay over the intervention period Mean number of referrals per practice per month: Control 2.97 (SD 3.22) knee, 2.88 (SD 3.05) spine Intervention 1.87 (2.4) knee, 1.76 (2.38) spine	Reported associations between elements for logic model: Effect of educational reminder, no effect of audit and feedback

Ridsdale 2008[124] Country: UK Study design: Evaluation Data collection method: Questionnaire Aim: To describe the training of GPwSIs in headache and the setting up of a GPwSI clinic in general practice, and report on a comparison with the existing neurology service Detail of participants (number, any reported demographics): Five GPwSIs were trained. Each agreed to provide a service for patients in their own practices A total of 211 consecutive patients with headache were sent the postal questionnaire Fifty-six hospital attendees responded, and 61 responded from the clinic run by the GPwSI. There was no significant difference in the age (mean 41.1 years, SD 15.2 years vs. mean 38.3 years, SD 2.78 years; $p = 0.2$) or in the proportion of each sex (57% female vs. 53% female; $\chi^2 = 0.54$; $p = 0.77$) of responders vs. non-responders, respectively	Intervention: The intervention involved training GPs as GPwSIs and setting up a GP headache service. A questionnaire survey was conducted, measuring headache impact, satisfaction, and cost estimates Control: NA Length of follow-up: NA Response and/or attrition rate: 117 patients (55%) responded Context (from what/who to what/who): GP referral to neurology	Outcome measures: Case severity, patient satisfaction, and cost	Main results: There was no significant difference in headache impact between hospital (mean score 61.2, SD 10.4) and GPwSI clinic attendees (mean score 64.3, SD 9.3), after adjustment for age, sex, and ethnicity, mean difference 2.7; 95% CI 1.6 to 7.0). There was no measurable difference in the frequency of severe headache pain between the groups (AOR 1.05; 95% CI 0.47 to 2.32), or in how often headaches limited their daily activities (AOR 1.57; 95% CI 0.72 to 3.41) Patients were significantly more satisfied with the GPwSI service, particularly that the service was effective in helping to relieve their symptoms (89% vs. 76%; AOR 7.7; 95% CI 2.7 to 22.4) The cost per first appointment was estimated to be £136, with £68 for subsequent contacts. These are lower than costs for neurologist contact	Reported associations between elements for logic model: GPwSI services can satisfy the needs of patients with similar headache impact at costs that are lower than those for secondary care services

Robling 2002[60] Country: UK Study design: RCT Data collection method: NR Aim: To investigate whether method of access or method of guideline dissemination effects concordance with referral guidelines for MRI Detail of participants (number, any reported demographics): 123 practices in trial 1, 232 referrals. 121 practices continued to trial 2, 182 referrals	Intervention: Two trials ran sequentially, one examining method of access and the second the method of guideline dissemination (1) One group practice request MRI by telephone or second group requested in writing using a standard request form, third group could refer as wished (2) One group practice received guidelines via a seminar, second group received feedback via a newsletter with practice-specific data on referrals. A third group received both seminar and feedback, and a fourth group received guidelines only by post Number of hours: NA Delivered by who? Seminar facilitated by academic GP and researcher Control: Seven interventions compared with each other Length of follow-up: NA Response and/or attrition rate: 121 practices continued to trail two Context (from what/who to what/who): GP request for lumbar spine or knee MRI scan	Outcome measures: Concordance with local guidelines for referral Cost-effectiveness	Main results: Trail one – 65% of requests judged to be concordant with guidelines. No difference in concordance rate between the three groups. Telephone access proved unpopular among participants; trial concluded before reached target. Written access more cost-effective Trail two – 74% judged to be concordant. No association between method of dissemination of guidelines and concordance Requests made after dissemination of guidelines were more likely to be concordant, 74% vs. 65% (OR 1.62, $p < 0.005$). No control group receiving no guidelines, however, so may be a trend rather than impact of guidelines Requests from larger practices more likely to be concordant (OR 1.18 per 1000 registered patients, $p < 0.005$) Cost per seminar £224.87 (£80 per trainee) Telephone access not popular; however, some GPs valued the direct feedback	Reported associations between elements for logic model: Dissemination of guidelines had some impact on appropriacy of referral Method of accessing referral had no impact on appropriacy

Rosen 2006[128] Country: UK Study design: Observational comparative cohort design Data collection method: Hospital data and questionnaires Aim: To evaluate the impact of GPwSI services on access to specialist care, user satisfaction and costs Detail of participants (number, any reported demographics): Four sites – three with dermatology GPwSI services and one in which a GPwSI musculoskeletal service has been developed as part of a wider reorganisation of orthopaedic, rheumatology and physiotherapy services	Intervention: Quantitative analysis of GPwSI clinic and hospital outpatient activity data Referrals were compared from GP practices that had access to GPwSI clinics and those that did not Self-completed postal questionnaires were used to assess patient experiences of GPSI clinics and to assess the views of GPs referring patients to GPwSI clinics. Costs were assessed using a template of costs incurred in setting up and running the service from the perspective of PCT or hospital trust Control: No access to GPwSIs Length of follow-up: NR Response and/or attrition rate: NR Context (from what/who to what/who): GP to specialist	Outcome measures: Changes in activity, referral rate and waiting times over two 6-month periods before and after the introduction of GPSI services Patient experiences Cost	Main results: The association between the introduction of GPwSI clinics and hospital referral rates was variable and unpredictable There were no significant changes in hospital referral rates following the introduction of GPwSI clinics in any of the sites studied. Overall referrals to hospital and GPwSI clinics combined increased in the three sites for which data were available The likelihood of referral, calculated as the RR, adjusted for baseline and linear time trend, did not change after the launch of the GPwSI clinics in any of the sites studied. Small changes in risks of referral from studying control practices did not reach statistical significance. In the musculoskeletal site, where all practices had access to GPwSI clinics, there was a significant ($p = 0.08$) 13% increase in overall referrals The association between the launch of GPwSI clinics and hospital outpatient waiting times was variable. After adjustment for secular trends, there was evidence of decreased waiting times for hospital appointments after the introduction of the GPwSI service in two sites and of increased waiting times in two sites. Interview data revealed that changes in the staffing and organisation of each clinic might also have influenced these findings There was no consistency across sites in the methods used to monitor and evaluate the costs of establishing and running GPwSI clinics. Using available data, the cost per GPwSI appointment in each site ranged from £35 to £93. Data were not available to compare the costs of hospital and GPwSI clinics	Reported associations between elements for logic model: That a GPwSI clinic would reduce hospital referrals from practices with access to that clinic relative to control practices was not supported by the data

Rowlands 2003[26] Country: UK Study design: Questionnaire data collected during RCT Data collection method: Survey of GPs who took part in an educational intervention (referral meetings) Detail of participants (number, any reported demographics): 13 practices in intervention arm, practices with four or more partners, health authorities in London. 60 of the 62 doctors eligible responded	Methods: Questionnaire data collected during RCT of GPs who took part in an educational intervention (referral meetings) Control: None Length of follow-up: None Response and/or attrition rate: NR Context (from what/who to what/who): GP to specialist	Outcome measures: Likert scale rating of how useful GP found the components of the intervention	Main results: Educational value of the meetings was rated as mean 6.7 (range 4.4–8) on a scale where 0 = no value and 10 is extremely valuable 48 doctors found the meetings 'useful', remainder 'not sure' 98% valued opportunity to discuss problems with partners. Comments that doctors learned from each other, found out about new referral pathways and possible alternatives to referral Several doctors commented on patient pressure to refer, feedback mixed, overall feeling that referral meetings might have a short-term effect on enabling doctors to resist pressure for unnecessary referrals but that the effect might only be short term. Less than half of doctors became involved with development of formal referral or clinical protocols. 88% noted a change in their referral practice. More than half felt they used more internal referrals between GPs. More than one-third reported an increased tolerance of clinical uncertainty and more confidence to resist pressure from patients. 39% said they were more aware of financial implications to the practice of NHS referral. 29% more aware of financial implications to NHS as a whole. 20% of doctors said they had requested pathology tests more frequently No change on referral rate in intervention group	Reported associations between elements for logic model: Value of educational intervention Patient pressure Tolerance of uncertainty Awareness of financial implications of referral Discrepancy between reporting perception of changed practice and actual change in practice

DOI: 10.3310/hsdr03240

Salisbury 2005[125] Country: UK Study design: RCT Data collection method Aim: The aim of this study was to investigate the effectiveness, cost-effectiveness, accessibility and acceptability of a PCDS in comparison with a hospital outpatient clinic for dermatology Detail of participants (number, any reported demographics): 30 practices in one PCT area; $n = 768$ patients eligible. 556 (72%) were randomised: 354 to PCDS and 202 to outpatients	Intervention: A RCT comparing patients referred to the PCDS with those receiving usual care at the hospital outpatient clinic The Bristol PCDS was staffed by two GPSIs and a specialist nurse, and provided from a suburban health centre. Patients are referred by their GPs to the outpatient Dermatology Centre at the Bristol Royal Infirmary as usual. Those who appear on the basis of their referral letter to be suitable for management in the PCDS are given an appointment there rather than at the outpatient department. At the time of the trial, suitable patients were adults with non-urgent skin conditions with a provisional diagnosis made by their GP Control: Usual care at the hospital outpatient clinic Length of follow-up: 9 months Response and/or attrition rate: 422 (76%) were followed up Context (from what/who to what/who): GP to dermatology	Outcome measures: Clinical Satisfaction Did not attend Hospital referral	Main results: The PCDS was more accessible [the difference between means on the access scale (scored out of 100) was 14, 95% CI 11 to 19; $p < 0.001$] and patients had reduced waiting times by a mean of 40 days (95% CI 35 to 46 days; $p < 0.001$) Patients expressed slightly greater satisfaction with PCDS consultations (difference in mean CSQ, 4%; 95% CI 1% to 7%; $p = 0.011$) and were more likely to prefer care at PCDS, both at baseline and after 9 months Fewer PCDS patients (6%) than hospital patients (11%) failed to attend their initial appointment, but overall did-not-attend rates for new and follow-up appointments were similar in both sites (PCDS, 8%; hospital, 11%). Of those patients seen initially at PCDS, 12% were referred to the hospital for one or more follow-up appointments There were no marked differences between the PCDS and hospital care in respect of clinical outcome (median Dermatology Quality of Life Index was 1 in both arms; ratio of geometric means, 0.99; 95% CI 0.85 to 1.15; $p = 0.9$, adjusting for baseline and stratification)	Reported associations between elements for logic model: Unclear

Sanderson 2002[126] Country: UK Study design: RCT Data collection method Aim: To assess the effectiveness, accessibility, and acceptability of a GPwSI service for skin problems compared with a hospital dermatology clinic Detail of participants (number, any reported demographics): 72% (556/768) of eligible patients agreed to participate and were randomised, 354 to the GPwSI service and 202 to hospital outpatient care	Intervention: Participants were randomised in 2 : 1 ratio to receive management by a GPwSI or usual hospital outpatient care The Bristol GPwSI dermatology service is staffed by two GPwSIs and a specialist nurse. A consultant dermatologist provides clinical support for two sessions per month Suitable patients had non-urgent skin problems and had been identified from the referral letter as suitable for management by a GPwSI Control: Usual hospital outpatient care Length of follow-up: 9 months Response and/or attrition rate: After 9 months, 422 (76%) Context (from what/who to what/who): GP to dermatology	Outcome measures: Primary outcomes were disease-related quality of life (dermatology life quality index) and improvement in patients' perception of access to services, assessed 9 months after randomisation. Secondary outcomes were patient satisfaction, preference for site of care, proportion of failed appointments, and waiting times to first appointment	Main results: 49% of the participants were judged suitable for care by the GPwSI service. Of 768 patients eligible, 556 (72.4%) were randomised (354 to GPwSI, 202 to hospital outpatient care) No noticeable differences were found between the groups in clinical outcome (median dermatology life quality index score = 1 both arms, ratio of geometric means 0.99, 95% CI 0.85 to 1.15) The GPwSI service was more accessible (difference between means on access scale 14, 11 to 19) and waited a mean of 40 (35 to 46) days less. Patients expressed slightly greater satisfaction with consultations with a GPwSI (difference in mean satisfaction score 4, 1 to 7), and at baseline and after 9 months 61% said they preferred care at the service	Reported associations between elements for logic model: The GPwSI service for dermatology was more accessible and preferred by patients than hospital outpatient care, achieving similar clinical outcomes

Sauro 2005[127] Country: Italy Study design: nRCT Data collection method: Clinical records Aim: To demonstrate the effect of using guidelines and spirometry on the management of COPD and asthma Detail of participants (number, any reported demographics): Patients of 24 GPs. $n = 32,785$	Intervention: Three study groups (not clear if randomly allocated): group 1 – spirometer and practice training in its use, including information on guidelines ($n = 11,050$); group 2 – only info on guidelines (no spirometer) ($n = 11,040$); group 3 – control ($n = 1049$) Control: No training and proceeded as usual Length of follow-up: NR Response and/or attrition rate: NA? Context (from what/who to what/who): GP referral to respiratory	Outcome measures: Referral Diagnosis	Main results: COPD was diagnosed in 5.8% of group 1, 1.5% of group 2 and 2.3% of group 3 ($p < 0.001$, CI 99%) Group 1 performed the test in 65.7% cases of COPD or asthma. Group 2 referred 7.8% of patients. The control group requested the test in 96.8% of the cases. There were significant differences between prescribing and/or utilising spirometry between all three groups ($p < 0.001$, data not given) Group 1 referred 7.5% to a specialist and diagnosis was confirmed in 91.8% of cases. Group 2 sent 7.8% to the specialist and diagnosis was confirmed in 75.8%. The control group referred 96.8%, of whom 27.2% only had a confirmed diagnosis	Reported associations between elements for logic model: Authors suggest guidelines alone are not useful, and could be dangerous

Schillinger 2000[144] Country: USA Study design: RCT Data collection method: NR Aim: To evaluate the effect of open access vs. physician approval of referral to ED and specialist services Detail of participants (number, any reported demographics): $n = 1121$ patients in intervention group, 1172 in control, uninsured who had at least one visit to family physician in previous 12 months	Intervention: Patients required prior approval from their primary care physician in order to receive specialty care at the local hospital. Computer programme blocked scheduling of unapproved appointments for these patients. Primary care physicians were required to complete a consultation form including clinical information and number of visits requested prior to unlocking of system Number of hours: NA Delivered by who? Primary physician Control: Physician approval not required prior to accessing services, self-referral or physician referral Length of follow-up: Study over 1-year period Response and/or attrition rate: NR Context (from what/who to what/who): GP to hospital specialty or emergency care	Outcome measures: Comparison of each patient utilisation of hospital inpatient and outpatient services in study year vs. previous year	Main results: Intervention patients decreased specialty use by 0.57 visits per year more than control patients did ($p = 0.04$, 95% CI −1.05 to −0.01) Intervention group increased primary care use; however, this was not significant Changes in patient satisfaction with care, perceived access to specialists and use of services were similar between the two groups	Reported associations between elements for logic model: Gatekeeping decreases specialty use

Schulpen 2003[134] Country: the Netherlands Study design: nRCT Data collection method: NR Aim: To evaluate joint consultation sessions Detail of participants (number, any reported demographics): 17 GPs within university hospital Maastricht; mean age 48.5 years; 12% female; 47% rural practice 43 non-participants acted as controls (characteristics comparable with those in intervention group). 166 patients; mean age 53.7 years; 27% male. 87 intervention group patients, 79 control group	Intervention: Joint consultation session between GP and consultant held 6-weekly consisting of three GPs and one visiting rheumatologist at the practice of a host GP. GPs presented each patient, consultant examined patient and formulated diagnosis and therapy policy together with GP Number of hours: 54 sessions held (for 87 patients) average of 1.4 hours a session. 47 follow-up consultations with standard duration of 15 minutes Delivered by who? Visiting consultant rheumatologist Control: No intervention Length of follow-up: 2-year intervention period Response and/or attrition rate: 65% of GPs agreed to participate Context (from what/who to what/who): GP to rheumatology	Outcome measures: Number of referrals to outpatient clinics for internal medicine, neurology, orthopaedic surgery, rheumatology Data over 1 year compared with previous year (this was year 1 and year 2 of study not pre intervention and during/post) Hours of consultant time	Main results: 23 of the 166 patients were referred by intervention GPs without using the intervention (16 patient declined, four GP opinion not suitable, three other reasons) Prior to intervention increasing referral rate to rheumatology department By end of study period the number of patients referred by each GP per year differed – 62% in intervention group compared with controls Average reduction in referral rate to rheumatology of –2.8 (SD 3.9) at end of second year of intervention period compared with first year in the intervention group. In the control group referral rate difference of zero (SD 2.1). Difference between intervention and control group before and after was significant ($p = 0.024$, Mann–Whitney *U*-test). Change not found for referrals to other specialisms	Reported associations between elements for logic model: Joint consultation effective in reducing referrals. Intervention and decrease in consultant hours Links between skilling GPs and reduction in referrals

Total 87.4 hours of rheumatology consultant time in intervention group, 83.3 hours spent by consultants seeing control patients. Per patient 1-hour intervention, 1.1-hour standard clinic consultation	Based on referral rates prior to the intervention if all patients had been referred to normal outpatient clinic would have taken 307.8 hours of consultant time. If all referrals during study period had been seen via the joint clinic system would have used 166.7 hours. Authors argue, therefore, a decrease of 46% in time spent by rheumatologist consultants	Joint consultations, however, lead to increased workload for GP, although providing skills for GP may reduce referrals. In this study large decrease in referrals for one condition (fibromyalgia) in intervention group may be due to GPs more confident at managing without referral

Shariff 2010[28] Country: UK Study design: Cohort Data collection method: NR Aim: To quantify the effect of a targeted continuing medical education module on improving GP diagnostic accuracy for skin cancer Detail of participants (number, any reported demographics): NR	Intervention: All referrals made under the 2-week wait rule to the skin cancer services of a teaching hospital in the north-east of England, covering a population of approximately 700,000 were initially studied for a 3-month period between July and August 2006. This included referrals to both the plastic surgery and dermatology departments The 94 GPs in the Hull and East Riding area were then sent a 12-page illustrated guide to common skin lesions positively highlighting common diagnostic pitfalls in the diagnosis of cutaneous melanoma and squamous cell carcinomas This educational module was aimed at building confidence in the diagnosis of lesions not requiring an urgent referral, especially basal cell carcinomas and seborrhoeic keratoses, referred through the 2-week wait route. After 11 months, all 2-week wait referrals were prospectively studied between August and October 2007 Number of hours: NA Delivered by who? NA Control: NA Length of follow-up: 11 months Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for suspected skin cancer	Outcome measures: The main outcome measure was the percentage of correctly referred squamous cell carcinomas and melanomas	Main results: 237 referrals were made between July and August 2006, and 223 referrals between August and October 2007 The proportion of appropriately referred skin cancers (squamous cell carcinomas and melanomas) was 23.2% before continuing medical education, and 20.6% after continuing medical education There were no differences in pick-up rates before and after the continuing medical education among suspected squamous cell carcinomas (21.1% vs. 29.7%) or melanomas (24.6% vs. 15.1%, respectively) Referrals to plastic surgery were more likely to be confirmed histologically as melanomas or squamous cell carcinomas (23.6% and 33.7%, respectively) than those made to dermatology (17.5% and 15.3%, respectively)	Reported associations between elements for logic model: The proportion of correctly suspected skin malignancies under the 2-week wait initiative remains low despite education A targeted continuing medical education module sent to GPs fails to improve pick-up rates

Shaw 2006[77] Country: UK Study design: cRCT Data collection method Aim: To determine the effects of providing a *H. pylori* serology service for GPs on demand for open-access endoscopy Detail of participants (number, any reported demographics): Forty-seven general practices in Gloucestershire	Intervention: General practices were stratified by endoscopy referral rate and randomised into two groups. The intervention group was provided with access to *H. pylori* serology testing and encouraged to use it in place of endoscopy for patients aged under 55 years with dyspepsia. They were sent written information promoting the use of the serology service in place of endoscopy for patients under the age of 55 years suffering from dyspepsia without alarm symptoms and were issued with a summary of the Maastricht consensus statement on the management of *H. pylori*. The GPs remained free to refer for open-access endoscopy as they felt necessary Number of hours: NA Delivered by who? NA Control: Endoscopy usual care Length of follow-up: NR Response and/or attrition rate: NR Context (from what/who to what/who): GP referral for open-access endoscopy	Outcome measures: Endpoints were referral for endoscopy and serology use	Main results: The number of endoscopy referrals fell in both groups during the study period, but fell by a greater amount in the intervention group than in the control group. During the 2-year study period, 626 referrals were received from the intervention group compared with 771 from the control group, a crude reduction of 18.8% There was a significant reduction in referrals for endoscopy in the intervention group compared with the control group: 18.8% (95% CI 5.0% to 30.6%, $p = 0.009$)	Reported associations between elements for logic model: Providing GPs with *H. pylori* serology testing reduced demand for open-access endoscopy, but by less than previous studies had predicted

Simpson 2003[143] Country: UK Study design: Before-and-after Data collection method Aim: To investigate the effect of employing counsellors in general practice on referral rates to mental health services Detail of participants (number, any reported demographics): 85 GP practices in South Derbyshire	Intervention: The practices employed counsellor – the counsellors were well established and practices are allocated 6–12 hours per week Control: NA Length of follow-up: 8 years (retrospective data) Response and/or attrition rate: Context (from what/who to what/who): GP to psychiatry	Outcome measures: Referral Drug prescribing	Main results: The findings suggest that the cost of the counsellor could be offset elsewhere The provision of counselling had no statistically significant effect on referrals or the volume and cost of prescribing	Reported associations between elements for logic model: Unclear

Simpson 2010[78] Country: UK (Scotland) Study design: Retrospective data analysis and survey of GPs Data collection method: Patient CT findings reviewed a questionnaire to referring GP and cost-effectiveness estimate Aim: To assess the significance of pathology, impact on service and GP satisfaction with direct access to CT for chronic daily headache Detail of participants (number, any reported demographics): $n = 4404$ scans on patients presenting with chronic headache for more than 3 months. $n = 986$ GPs completed survey	Intervention: Direct access to head CT for GPs Number of hours: NA Delivered by who? GP carried out CT Control: None Length of follow-up: NA Response and/or attrition rate: All patients referred for head CT 1999 to 2007 (8 years) 23% return rate for GP questionnaires Context (from what/who to what/who): GP to specialist service for chronic headache (usually neurology or general medicine)	Outcome measures: Number of referrals GP satisfaction Cost estimate	Main results: 10.5% of scans indicated abnormalities. 1.4% of these were judged to be a potentially causative factor for the symptoms GPs reported that if direct access CT had not been available then 44% would have referred to neurology and 38% to general medicine. 10% of patients would not have been referred Following scan 86% did not require further specialist referral 67% of reports issued following scan were received in 1 week, 79% within 14 days. Content of report understood and acceptable to 99% of GPs, 1% reported terminology not understood. 100% of comments were positive about the service Without direct access 90% would have been referred cost estimate of £503,428. Cost of scan and outpatient appointments for patients in study estimated £602,026.80. A specialist headache clinic where typically 29% are referred for scans would cost £131,991.68 with a further review appointment costing total £688,708.61. Cost-saving estimate £86,681.81	Reported associations between elements for logic model: Reduced waiting time for patients Low number of referrals identified abnormality Lower uptake of resources – 83% fewer total number of patients referred for specialist opinion. Cost-effectiveness unclear

Slade 2008[117] Country: UK Study design: cRCT (clustered by practice), some qualitative data on views of staff Data collection method: Rating scale of severity and appropriateness, observation of team meetings, ?interviews with staff (not reported how data collected) Aim: To investigate whether or not introducing standardised assessment of severity improved referral agreement Detail of participants (number, any reported demographics): 281 GPs from practices representative of population and including high deprivation inner-city areas. Two areas – London borough of Croydon and Manchester. 1061 mental health referrals to 11 CMHTs	Intervention: GPs complete threshold assessment grid, a one-page assessment of mental health severity and attach to referral form/letter Number of hours: NA Delivered by who? NA Control: Usual referral practice Length of follow-up: NA Response and/or attrition rate: Data available for 1055 patients: $n = 514$ intervention, $n = 541$ control Context (from what/who to what/who): GP to CMHT	Outcome measures: Appropriateness of referral Appropriate rating of urgency of referral Identification of appropriate professional to carry out the initial assessment Time taken for CMHT to discuss the referral	Main results: Reasons for practices approached to opt not to take part in the study – too busy, too much paperwork already, not interested, do not see benefit, too complicated, not interested unless paid Implementation was low – threshold assessment grid used with 25% of referrals. Blocks identified by GPs were forgetting to use the threshold assessment grid, threshold assessment grid was too simple and did not reflect the complexity of the patient, concern that the threshold assessment grid could be manipulated to coerce CMHTs to accept referral, fear of being used to restrict referrals. Blocks identified by CMHTs were GPs not willing to complete and threshold assessment grid scores not being discussed at meetings. One area called service development and supported by mental health trust, other with lower participation rates considered study research. No significant difference between trial arms ($p = 0.05$) for any of the comparisons Appropriateness of referral was 64% vs. 60% (intervention vs. control $p = 0.41$ adjusted), rating of urgency was 81% intervention vs. 76% control ($p = 0.15$), identification of appropriate professional was 89% intervention vs. 87% control ($p = 0.46$), time to discuss referral by MHT was 2.08 vs. 2.15 minutes ($p = 0.37$)	Reported associations between elements for logic model: Barriers to implementation No effect of intervention

Spatafora 2005[69] Country: Italy Study design: Before-and-after Data collection method: NR Aim: To evaluate a shared protocol Detail of participants (number, any reported demographics): 45 urological centres, 263 GPs; mean age 47 years; 18% female Patient characteristics described in another paper, 50 years or older and in general good health. Mean age 64 years. $n = 856$	Intervention: A short algorithm on procedures to be used with men with LUTS was developed by urologists and approved by a panel of experts. It was presented at a meeting with local GPs and revised in line with feedback and revised protocol was presented at each centre. The protocol was a clinical report form containing history, examination, use and outcome of tests, diagnosis Number of hours: NA Delivered by who? NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to urology outpatient clinics	Outcome measures: Percentage of patients managed by GP without referral Number of patients undergoing testing and cost of testing Time from first visit to final diagnosis	Main results: 16% of centres accepted the original protocol with no changes No significant change in referral pattern from baseline to intervention – 51.2% of patients managed entirely by GP, 44.3% referred to urologist after some diagnostic procedures and 4.5% referred without any diagnostic testing Use of digital rectal exam increased significantly from 32% to 41%, $p < 0.001$ This predominantly in centres which endorsed this test Overall time to diagnosis was 29 days baseline and 28 days T2. Total costs average T1 = €71.82, and T2 = €61.93 Discussion of use of different diagnostic tests	Reported associations between elements for logic model: Lack of change in referral patterns

Stainkey 2010[118] Country: Australia Study design: Service evaluation Data collection method: Patient data collected Aim: To evaluate a specialist appointment service for long-waiting patients Detail of participants (number, any reported demographics): 872 patients waiting for orthopaedic appointments in first wave, 6885 patients waiting for orthopaedic, ENT, neurosurgery, urology and general surgery appointments in second wave	Intervention: Letters sent to patients who had been waiting 2 years or more (triaged by the hospital as non-urgent). Patients respond if appointment still needed, and seen at specially arranged clinics Number of hours: NA Delivered by who? Administrative staff send letter, special clinics delivered by hospital Control: None Length of follow-up: NA Response and/or attrition rate: 101 of 872 patients responded in wave 1. 532 of 6885 patients responded in second wave Context (from what/who to what/who): GP to orthopaedic, ENT, neurosurgery, urology and general surgery	Outcome measures: Number of patients updating clinical information and attending a clinic Number of surgical procedures resulting from clinic attendance	Main results: In first wave 16 patients required procedures (of the 101 who had responded to the letter and been seen in a clinic) In the second wave 532 patients responded to the letter and were seen in a clinic. 177 had surgical procedures resulting from these appointments	Reported associations between elements for logic model: Process effective to identify small number of people on a long wait list in need of a procedure and identify those no longer in need of an appointment

Standing 2001[122] Country: UK Study design: Before-and-after Data collection method: Patient notes Aim: To investigate whether or not ambulatory ECG monitoring in general practice could decrease unnecessary referrals and pick up unsuspected cardiac abnormalities Detail of participants (number, any reported demographics): $n = 73$ (26 male, 47 female) patients from 27 GPs. 52 (71%) had no previous cardiac history, 12 (16%) had documented arrhythmia and 8 (11%) had ischaemia, one patient had a myocardial infarct and two had mitral valve incompetence	Intervention: Patients were recruited to use a novel ambulatory ECG machine designed to detect arrhythmias in general practice Patients were selected if they had signs and symptoms indicative or cardiac abnormalities including dizzy spells, fainting, palpitations or pounding chest, as well as considering their medical history, and general profile Patients made two GP visits. On the first they underwent a normal consultation and the GP recorded any diagnosis made, whether or not he would refer the patient and, if so, what test he would request. The ECG device was fitted and the patient was given a diary card and general advice about the equipment. The patients ECG signal was then analysed for 24 hours. The patient was instructed to return to the surgery the next day where the GP reviewed the reported generated by the equipment and decided whether or not to refer the patient to the cardiology clinic Number of hours: 24 hours Delivered by who? GP Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to cardiology outpatients	Outcome measures: Referral to cardiology outpatients	Main results: In the open study, 68% of patients were studied after reporting palpitations, others complained of dizziness and chest pain Following GP assessment prior to using the ECG machine, GPs were intending to refer 49 (68%) to cardiology outpatients for further tests. Of these, three cases were considered to need urgent appointments The ECG data identified 22 patients with atrial ectopic beats, and 13 with ventrical ectopic beats, 13 cases of intermittent tachycardia, seven of ST depression, two with pauses and two with missed beats. In seven patients no abnormality was detected. 3 further cases gave non-diagnostic results (probably due to poor fitting). The number of patients that GPs decide to refer to cardiology outpatients reduced by 60% from 49 to 19 patients. However, the number of patients identified as urgent increased from 3 to 7. 36 (of 49) were unlikely to need cardiology referral	Reported associations between elements for logic model: Use of ambulatory ECG in primary care refines the screening process and has the potential to reduce referrals to cardiology outpatients

Stoves 2010[103] Country: UK Study design: Before-and-after Data collection method: Aim: Comparing nephrology referrals from implementation and non-implementation practices following the introduction of electronic consultations (e-consultations) for chronic kidney disease Detail of participants (number, any reported demographics): 17 general practices and a secondary care nephrology service in Bradford, UK Data from 17 implementation and 68 non implementation practices	Intervention: Electronic sharing of primary care electronic health records with the nephrology service was introduced to implementation practices. Participating GPs attended education workshops and received paper and e-guidance about the new service The service allows GPs to send electronic referrals and share patient electronic health records with a renal specialist after first obtaining verbal patient consent. GPs use criteria agreed in local guidelines to 'request advice' or 'question the need for hospital clinic review' The renal specialist can open the electronic health record and a decision is then made whether a patient should be referred to clinic, undergo tests or interventions in the primary care setting, or continue to be monitored and treated by the primary care team Control: NA Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GP to nephrology	Outcome measures: The number, appropriateness and quality of new referrals (paper and electronic) from primary care, the timeliness of responses and the satisfaction of patients and health professionals with the new service	Main results: There was a significant reduction in paper referrals from implementation practices. E-consultation provided nephrologists with access to more clinical information. GPs reported that the service was convenient, provided timely and helpful advice, and avoided outpatient referrals. Specialist recommendations were well followed, and GPs felt more confident about managing chronic kidney disease in the community The mean age of patients referred electronically was greater than patients referred by letter (72.8 years vs. 68 years, $p < 0.01$) The mean (SE) interval between the GP sending an e-consultation referral and the renal specialist submitting an electronic response was 7 (0.8) days. This contrasted with a mean wait of 55.1 (1.6) days between the GP sending a paper referral and the patient attending a hospital clinic When GPs were requesting clinic review by letter, only 56% of referrals were appropriate according to local criteria (71% and 52% for implementation and non-implementation practices, respectively), but 98% of these were accepted for hospital clinic review. This might have been due to insufficient information in some referral letters and a general reluctance to cancel appointments that had been pre-booked by the GP or the patient. By contrast, 90% of e-consultations that questioned the need for clinic review were appropriate, and clinic assessment was recommended in only 27% of cases	Reported associations between elements for logic model: E-consultation promotes effective management of patients with mild to moderate chronic kidney disease in primary care, allowing specialist resources to be directed towards supporting patients with more complex needs

Suris 2007[35] Country: Spain Study design: Before-and-after Data collection method: NR Aim: Effectiveness of GP training on referral Detail of participants (number, any reported demographics): Mean number of GPs in each health-care area was 11.7. Catalonia, Spain, served by 15 health-care areas with 117 GPs. One general hospital referral centre for 10 health-care areas with a rheumatology unit	Intervention: Consultants carry out a biweekly session with GPs in each health-care area. Mean of eight GPs attended each session. Programme lasted for 1 year Number of hours: 1-hour biweekly, 120 sessions carried out by four rheumatologists. New cases discussed, local guidelines revised and discussed Delivered by who? NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to rheumatology	Outcome measures: Activity – number of sessions, number of GPs attending, number of cases discussed Percentage of cases discussed that were not referred to the unit Number of referrals Mean waiting time GP satisfaction	Main results: Average number of cases discussed in a session was 4.6, of these a mean of 1.43 cases from each session were referred. Consultancy resolution was, thus, 69% At end of pilot year total number of GP referrals was 31% lower than in previous year (1141 vs. 1652, no significance levels reported). Total number of new visits to the unit, however, increased 3.34% during the programme GP resolution rate for musculoskeletal disorders improved significantly. Referral rate to rheumatology unit decreased significantly from 8.13 per 1000 to 5.53 per 1000 (2.59%, 95% CI 2.09 to 3.10; $p < 0.001$) Waiting time to be seen dropped by a mean of 15 days over the study period (95% CI 119.7 to 9.2) GP satisfaction – no table in document printed – five items evaluated by GPs showed significant improvement ($p < 0.001$). Most improvement was in terms of patient accessibility	Reported associations between elements for logic model: Providing outreach consultation can reduce referrals

Sved-Williams 2010[72] Country: Australia Study design: Before-and-after Data collection method: Referral data plus GP survey Aim: Described and evaluate a service that provides a single point of entry for GPs wishing to refer their patients for one off psychiatric consultations Detail of participants (number, any reported demographics): 45 psychiatrists, 301 GPs	Intervention: All psychiatrists in the region were invited to provide reserved appointments to an administrative officer based at the Department of General Practice. They could specify the number of appointments, and withdraw unfilled appointments at any time. Mental Health Programme Officers in all Divisions of General Practice were briefed about the service and asked to advertise it to GPs in their area To make an appointment, a GP or practice nurse phoned a dedicated number Mon-Fri 9–5. There was no paperwork; the GP was supplied with the appointment time, along with the name and contact details of the psychiatrist over the telephone. GP and practice nurses involved in the referral process were surveyed at 10 months into the service Number of hours: NA Delivered by who? Psychiatrists Control: NA Length of follow-up: 28-month study Response and/or attrition rate: 26% of GPs responded to survey Context (from what/who to what/who): GP referral to psychiatry	Outcome measures: Service use	Main results: 824 patients were referred by 301 GPs. From August 2005 to March 2007 84% of offered appointments were filled 45/200 psychiatrists contributed appointments during the 28-month study period Use of the service rose from six referrals to 10 per week over the course of the study. 55% of psychiatrists continued to provide regular appointments after the study period Only 26% of GPs responded to the survey. Of those, 94% had received a written management plan within the specified 14-day period, and 40% had been verbally contacted by the psychiatrist	Reported associations between elements for logic model: A single point of access for GPs to private psychiatric consultants increased access for many patients to expert assessment and management plans

Tadros 2009[96] Country: UK Study design: RCT Data collection method: NR Aim: Referral of suspect skin cancers as well as non-malignant symptomatic skin lesions using high-quality digital images transferred via a secure electronic referral system vs. conventional pathways Detail of participants (number, any reported demographics): 300 patients referred by electronic referral service	Method: A comparison of the diagnoses made from digital images with the diagnoses confirmed on pathology reports for lesions excised is described using a random selection of patients' images and referrals. Intraobserver analysis was also assessed. A sample group of patients with lesions deemed as benign, not requiring surgery or other treatment and therefore not seen in secondary care were revisited at a special clinic to determine the safety of the referral system Control: Conventional referral Length of follow-up: NR Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for suspected skin cancer	Outcome measures: Speed of referral, diagnosis and subsequent treatment	Main results: In this series of 300 patients the study concludes that digital image referral for skin malignancy and other cutaneous lesions reduced the interval between referral and diagnosis by 81% and referral to commencement of treatment in suspect lesions by 30% Diagnostic accuracy in a random sample of 30 patients was comparable to that reported for patients seen in face-to-face consultations. High levels of GP and patient satisfaction were recorded	Reported associations between elements for logic model: Digital image referral for skin malignancy and other cutaneous lesions is a safe and cost-effective referral pathway, significantly reducing the interval between referral diagnosis and onset of treatment for skin malignancy

Tan 2007[140] Country: UK Study design: Referral pattern analysis Data collection method: Analysis of new referrals 1996–2005 Aim: To evaluate the impact of restricted-referral guidance Detail of participants (number, any reported demographics): None (document only a brief report)	Intervention: Restricted-referral guidance issued to GPs for dermatology referrals inspired by the Oregon Health Plan, a rationing policy. A list of conditions that the service would no longer treat or treat only in exceptional circumstances. Introduced in 2000 Number of hours: NA Delivered by who? NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to dermatology clinic	Outcome measures: Number of referrals	Main results: Following introduction a reduction in rate of increase of referrals occurred. For a further 3–4 years the volume of new referrals remained static Data only in the form of a chart – looking at the chart 1996 around 450 new referrals, 2000 peak of 800 new referrals, 2001–4 peak of around 600 referrals per year	Reported associations between elements for logic model: Effectiveness of rationing system

Thomas 2003[79] Country: UK Study design: cRCT Data collection method: Hospital/GP records Aim: To evaluate the effectiveness and efficiency of a guideline-based open-access urological investigation service Detail of participants (number, any reported demographics): 66 general practices in the Grampian region of Scotland referring 959 patients	Intervention: General practices were randomised to receive either referral guidelines and access to the investigation service for LUTS or referral guidelines and access to the investigation service for microscopic haematuria Participating GPs were offered a 2-hour educational meeting and were mailed a guideline package, including a guideline booklet, quick reference flow chart and structured referral checklists Number of hours: 2-hour training Delivered by who? NR Control: Each condition provided a control for the other Length of follow-up: 12 months Response and/or attrition rate: NR Context (from what/who to what/who): General practice to urology	Outcome measures: Compliance with guidelines (number of recommended investigations completed), number of general practice consultations, the number and case mix of referrals, waiting time to initial hospital appointment, and the number of patients with a management decision reached at initial appointment and discharged by 12 months after referral	Main results: GPs' compliance with referral guidelines increased (difference in means 0.5, 95% CI 0.2 to 0.8; $p = 0.001$). Approximately 50% of eligible patients were referred through the new system. The number and case mix of referrals were similar. The intervention reduced the waiting time from referral to initial outpatient appointment (ratio of means 0.7; 95% CI 0.5 to 0.9, patients with LUTS only) and increased the number of patients who had a management decision reached at initial appointment (OR 5.8, 95% CI 2.9 to 11.5; $p < 0.001$, both conditions) Patients were more likely to be discharged within 12 months (OR 1.7, 95% CI 0.9 to 3.3; $p = 0.11$). There were no significant changes detected in patient outcomes. Overall, the new service was probably cost saving to the NHS	Reported associations between elements for logic model: The guideline-based open-access investigation service streamlined the process of outpatient referral, resulting in a more efficient service with reduced outpatient waiting times, fewer outpatient and investigation appointments and release of specialist and clinic time

Thomas 2010[80] Country: UK (Scotland) Study design: Analysis of referral data Data collection method: Analysis of patient data, questionnaire to GP Aim: To estimate the referral rate of patients with chronic headache to open-access CT and the effect on neurology referral rates Detail of participants (number, any reported demographics): $n = 232$ patients referred for brain CT. Patients aged older than 18 years with symptoms of chronic unchanging headache (duration not specified). Age range 20–85 years. 72 GP practices; 309 GPs	Intervention: GP direct access to CT brain scans at three sites Number of hours: NA Delivered by who? GPs Control: None Length of follow-up: 1 year Response and/or attrition rate: 88% of GPs returned questionnaire 1 year follow up for 215 patients Context (from what/who to what/who): GP to specialist neurology referral	Outcome measures	Main results: Referral rate to open-access service was 1.2% of headache consultations by GPs. Open-access scans accounted for 4% of the annual number of scans Scan not performed for 17 of the 232 due to non-attendance, cancellation or incomplete details. 215 scanned. Of these, three lesions were identified which may have caused chronic headache. 1.4% yield for significant findings and 10.2% for non-significant findings. 88.4% of scans were normal Service used by 45% of GPs from 82% of practices. Highest number from any one practice was seven, most referred one GPs reported that in 88% of cases the scan had stopped a referral to secondary care. The results of the scan were said to have caused a referral in 5% of cases. In 6% of cases a referral had been made at the same time as the scan requested One-year follow-up of the patients scanned – 14% (30) were subsequently referred to neurology clinic because of headaches; of these, 40% at the same time as CT scan request and 60% referred after their brain-scan CT. Of these later referrals 17 of the 30 had normal CT findings	Reported associations between elements for logic model: Scanned patients had a lower referral rate to neurology immediately and in the year following the scan Referrals of scanned patients to neurology were reduced by 86%

Tierney 2003[116] Country: UK Study design: RCT Data collection method: Electronic patient data Aim: To assess the effects of computer-based cardiac care suggestions Detail of participants (number, any reported demographics): 706 outpatients with heart failure and/or ischaemic heart disease	Intervention: Evidence-based cardiac care suggestions, approved by a panel of local cardiologists and general internists, were displayed to physicians and pharmacists as they cared for enrolled patients. Evidence-based guidelines published by the Agency for Health Care Policy and Research and national professional organisations were used to develop the cardiac care rules During the study period, physicians received a variety of patient-specific feedback about various clinical issues. For patients in the physician control group, these suggestions were withheld. For patients in the physician intervention group, the cardiac care suggestions were printed at the end of the medication list on the encounter form and displayed as 'Suggested Orders' on physicians' workstations. Physicians could view the guidelines and references via the 'help' key. They could avoid all suggestions made for that patient that day by hitting the 'escape' key Number of hours: NA Delivered by who? NA Control: No intervention Length of follow-up: Each firm had an equal number of intervention and control sessions Response and/or attrition rate: NR Context (from what/who to what/who): GP referral to cardiology	Outcome measures: Adherence with the care suggestions, generic and condition-specific quality of life, acute exacerbations of their cardiac disease, medication compliance, health-care costs, satisfaction with care, and physicians' attitudes towards guidelines	Main results: Subjects were followed for 1 year during which they made 3419 primary care visits and were eligible for 2609 separate cardiac care suggestions The intervention had no effect on physicians' adherence to the care suggestions (23% for intervention patients vs. 22% for controls). There were no intervention-control differences in quality of life, medication compliance, health-care utilisation, costs, or satisfaction with care. Physicians viewed guidelines as providing helpful information but constraining their practice and not helpful in making decisions for individual patients	Reported associations between elements for logic model: Care suggestions generated by a sophisticated EMR system failed to improve adherence to accepted practice guidelines or outcomes for patients with heart disease

Twomey 2003[42] Country: UK Study design: Before-and-after Data collection method: An audit of GP referral for plain radiographs in the following areas – hip, knee, cervical spine, and lumbar spine – was undertaken for the calendar years 2000 and 2001 Aim: To decrease GP referral to radiology Detail of participants (number, any reported demographics): None	Intervention: Established a procedure for the development of care pathways This procedure consisted of a framework for considering evidence and engaging a wide range of stakeholders which was followed for the development of a local guideline called Making the Best Use of Our Local Radiology Department. It considered the appropriate utilisation of plain radiography within a number of diagnostic areas. The rationale of this element of the guideline was to facilitate an evidence-based approach to diagnostic use of plain radiography by local GPs with the anticipated reduction in overall number of requests. The proposal was discussed at the PCG Clinical Governance and shared with rheumatology and orthopaedic consultants. The proposed guidelines were circulated to all GPs within North East Lincolnshire PCT to be utilised for future referrals within clinical areas specially identified Number of hours: NR Delivered by who? NA Control: None Length of follow-up: NR Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to radiology for radiograph (hip, knee, cervical spine and lumbar spine)	Outcome measures: Referral to radiology	Main results: GP referrals to radiology department for plain radiography declined: Year 2000, $n = 2365$ Year 2001, $n = 1077$ Reduction: Total 1288 % 54 The audit demonstrates a significant reduction in referrals across all diagnostic areas reviewed Total number of plain radiograph requests: Year 2000, $n = 6650$ Year 2001, $n = 4291$ Reduction: Total 2359 % 35.5	Reported associations between elements for logic model: The reduction in primary care referrals for plain radiography for the priority areas within the guideline is mirrored by an overall reduction in primary care plain radiography requests The audit demonstrates a very positive response by local GPs and reflects an effective and shared implementation of the guideline

van Bokhoven 2012[120] Country: the Netherlands Study design: Cluster RCT randomised at GP practice level Data collection method: Test ordering numbers, questionnaires Aim: How feasible is watchful waiting compared to immediate blood test ordering? Detail of participants (number, any reported demographics): $n = 498$ patients presenting with unexplained complaints that did not cause alarm for the GP including fatigue, abdominal complaints, weight change, musculoskeletal complaints, itch. Mean age 43 years; 28% male. 57 Dutch GP practices; 63 GPs; mean age 45 years; 74% male	Intervention: Group A: Watchful-waiting approach Group B: Watchful waiting plus 'quality improvement strategy' – two small group meetings including explanation of diagnostic value of tests, discussion of difficulties dealing with patients with unexplained complaints, goal setting to change GP behaviour. On practice visit Number of hours: 5 hours small group meeting plus one hour practice visit, plus homework tasks for group B Delivered by who? Not described in this paper, presumably members of the research team? Control: GPs ordered tests immediately Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to any specialty for unexplained symptoms	Outcome measures: Percentage of patients for whom tests ordered Number of tests ordered at first consultation Number of tests ordered after 4 weeks GP communication and performance (self-reported and patient reported)	Main results: No statistically significant difference between the two intervention groups in terms of number of patients for whom tests were ordered or GP performance (performs adequate examination, explains findings to patient) GPs in intervention groups 'better scores' for knowledge about seriousness of complaint and GP asks patient to return if symptoms do not resolve First consultation GPs ordered mean of seven tests in both control group and trained intervention group, six in untrained intervention group. 52 of the 498 patients returned to the GP after 2 weeks for a further consultation Lack of effect of training however this may be due to limited room for improvement Author conclusion: Watchful waiting is a feasible approach for patients presenting with unexplained symptoms. Laboratory testing rarely used later on as few patients returned	Reported associations between elements for logic model: Lack of effect of providing GP training Watchful waiting can reduce GP use of blood testing and, therefore, potentially could reduce onward referral if tests are false positive

Van Dijk 2011[123] Country: the Netherlands Study design: Retrospective medical record analysis Data collection method: Electronic medical record data examined for patients where benign neoplasm skin/naevus, sebaceous cyst or laceration/cut and/or minor surgery was performed Aim: To examine associations between number of minor GP surgical interventions and hospital referrals Detail of participants (number, any reported demographics): Data from 48 GP practices – $n = 14{,}202$ patients, mean age 39 years, 51% female. 4440 laceration/cut, 5373 benign neoplasm skin/naevus, 2220 sebaceous cyst	Intervention: GP providing minor surgery intervention in primary care Number of hours: NA Delivered by who? GP Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to hospital	Outcome measures: Number of referrals Type of surgery Distance to hospital Presence of a primary care nurse GP workload	Main results: GP practices that performed more minor surgery had a lower referral rate for patients with a laceration/cut (–0.38, 95% CI –0.6 to –0.11), and for patients with a sebaceous cyst (–0.42, 95% CI –0.63 to –0.16) but not for those with benign neoplasm skin/naevus (–0.26 95% CI –0.51 to 0.03) Minor surgery was more often performed in older patients. Presence of primary care nurse only affected referral for benign neoplasm. Women had a smaller likelihood of minor surgery and smaller likelihood of referral for sebaceous cysts Significant negative correlation between minor surgery intervention and referrals at a practice level. For laceration/cut and sebaceous cysts GP practices that perform more minor surgery interventions refer fewer patients to a medical specialist. Presence of a primary care nurse and GPs workload showed a higher negative correlation Author conclusion: the effect of minor surgery on the rate of referral varied by diagnosis. Minor surgery associated with fewer referrals for sebaceous cysts and laceration/cuts but not for benign neoplasm skin/naevus. Absolute referral rate appeared only relevant for sebaceous cysts Performing five more minor surgery interventions per 100 care episodes would result in 4.3 fewer referrals for sebaceous cyst. In the UK an increase of 5% in GP minor surgery interventions for sebaceous cyst would result in saving of about £3000	Reported associations between elements for logic model: Referral management differs by type of diagnosis

Van Dijk 2010[141] Country: the Netherlands Study design: Retrospective patient data analysis Data collection method: Referrals to internists, ophthalmologists, cardiologists or mental health care Aim: To assess whether or not the introduction of primary care nurses affects referral rate for diabetes-related hospital treatment Detail of participants (number, any reported demographics): 25 practices in wave 1 (2004) and 29 in wave 2 (2006) described as a representative sample of Dutch general practices. Newly diagnosed type 2 diabetes patients. $n = 301$ in wave 1, 450 in wave 2. 50% male, mean age 61 years, mean distance to hospital 8.6 km, 39% unrelated comorbidity	Intervention: Introduction of primary care nurses (online file gives description of introduction process if needed) Number of hours: NA Delivered by who? Primary care nurses Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to secondary care for diabetes-related conditions	Outcome measures: Referrals Diabetes-related contacts Primary care nurse presence Comorbidity Distance to hospital	Main results: Referral rates tended to be low on average to internists, cardiologists and mental health care Referral rate to internists for newly diagnosed patients decreased for practices both with and without a practice nurse between the two time points (7.3% vs. 3.3%) The trend in referral patterns to internists for known diabetic patients was lower in general practices with primary care nurses than those without (OR 0.59, 95% CI 0.31 to 1.11; significant $p < 0.1$) The number of diabetes-related contacts did not differ between practices with and without primary care nurses	Reported associations between elements for logic model: Referral rates changed over time potential impact on interpretation of study findings No significant difference introduction of practice nurses

Van Dijk 2013[149] Country: the Netherlands Study design: Before-and-after Data collection method: patient EMRs Aim: The effects of replacing separate remuneration systems for publicly insured patients (capitation) and privately insured patients (fee-for-service) with a combined system of capitation and fee-for service for all on the quality of care in terms of guideline adherence were investigated Detail of participants (number, any reported demographics): 21,421 to 39,828 patients from 32 to 52 general practices	Method: A longitudinal study from 2002 to 2009 using data from patient EMRs in general practice. A multilevel (patient and practice) approach was applied to study the effect of changes in the remuneration system on guideline adherence Control: Length of follow-up: Response and/or attrition rate: Context (from what/who to what/who): GP referral for chronic and acute conditions	Outcome measures: Sixteen guideline adherence indicators on prescriptions and referrals for acute and chronic conditions	Main results: Guideline adherence increased between 2002 and 2008 by 7% for (formerly) publicly insured patients and 10% for (formerly) privately insured patients. In general, no significant differences in the trends for guideline adherence were found between privately and publicly insured patients, indicating the absence of an effect of the remuneration system on guideline adherence Adherence to guidelines involving more time investment in terms of follow-up contacts was affected by changes in the remuneration system. For publicly insured patients, GPs showed a higher trend for guideline adherence for guidelines involving more time investment in terms of follow-up contacts compared with privately insured patients	Reported associations between elements for logic model: Unclear

Vardy 2008[150] Country: Israel Study design: Evaluation Data collection method: Mixed method – attendance data, interviews with patients and PCPs Aim: To evaluate a copayment system Detail of participants (number, any reported demographics): Telephone interview data from $n = 3745$ patients, 10 urban clinics, who had been referred 48 PCPs interviewed, 54% female, average age 45.5 years	Intervention: Patient payment for attending specialist consultation. Described only as 'a relatively low fixed sum to be paid prior to the appointment' Number of hours: NA Delivered by who? NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to ENT, dermatology, orthopaedics, ophthalmology, cardiology, neurology, hypertension and diabetes. Included PCP and self-referral	Outcome measures: Reasons for not attending Sociodemographics	Main results: Attendance at planned appointment was 85% for specialist appointments in community and 91.7% for specialist hospital appointments in the time period when copayment was in operation. No difference self referral and physician referral. Only 2% reported copayment as the reason for not attending. 19% stated that copayment was a reason for not attending an appointment in the past Physicians stated need for copayment influenced referral decision especially with elderly or lower income patients	Reported associations between elements for logic model: Payment and service use

Vlek *et al.* 2003[135] Country: the Netherlands Study design: RCT Data collection method: NR Aim: To evaluate joint consultation sessions Detail of participants (number, any reported demographics): 49 GPs and 13 cardiologists. 306 patients. Mean age of patients 58 years	Intervention: Monthly joint consultation session between GP and cardiology specialist held over 18 months in surgery of GP. 3–4 patients could be examined and discussed at each session. Average seven sessions per GP (range 2 to 13 sessions) Number of hours: NA Delivered by who? Cardiologist Control: Normal care Length of follow-up: 1 year later patient assessed by a different cardiologist Response and/or attrition rate: 23% withdrawal in both groups Context (from what/who to what/who): GP to cardiology	Outcome measures: Number of patients referred	Main results: Fewer patients in the intervention group were referred to a cardiologist (33% vs. 52%, $p = 0.001$). The difference in referral rates showed an average decrease of referrals to cardiology of 6 per 1000 patients in the GPs from the intervention group. Further diagnostic procedures were required for 7% in intervention group vs. 16% in control group ($p = 0.013$)	Reported associations between elements for logic model: Referral to specialist services decreased

Walkowski 2007[63] Country: USA Study design: cRCT Data collection method: NR Aim: To test the effect of different academic detailing strategies to (1) inform PCPs of the high-performing cardiac specialists in their community and (2) facilitate increased referrals to these specialists Detail of participants (number, any reported demographics): General Practice, Internal Medicine and Family Practice physicians in five markets (Denver, Dallas, San Antonio, Austin and Dayton)	Intervention: This initiative involved sending letters to primary care physicians which requested that when the physician had a patient needing referral to a cardiac specialist or facility, that they refer them to a physician or facility that had earned the United Health Premium designation for both Quality and Efficiency of care. To facilitate those referrals, the primary care physicians were also provided with a hard-copy referral list of cardiac specialists and hospitals in their community, which could be posted at the referral desk or the receptionist desk. To determine the most effective approach to academic detailing, the pilot was divided into four test groups – (1) LRL only ($n = 3537$), (2) LRL plus follow-up telephone call from the local health plan ($n = 252$), (3) LRL plus e-mail reminder ($n = 1187$) and (4) LRL plus in-person follow-up visit from the local Market Medical Director ($n = 65$) Number of hours: NA Delivered by who? NA Control: Two control markets with similar populations and United Health Premium penetration did not receive intervention letters Length of follow-up: 3 months Response and/or attrition rate: NA Context (from what/who to what/who): General Practice referrals to cardiology	Outcome measures: Appropriate referral to a cardiology specialist	Main results: Initial 3-month pilot data showed an overall 6.3% increase of patients referred to a United Health Premium designated quality and efficient cardiac specialists overall compared with a baseline period of 12 months prior to the mailing. These results were based on evaluation of claims for the 3 months after the distribution of the letters. Intervention effects ranged from +17% change (letter + call) to + 22% change (letter + visit), vs. 0.3% change in the control group	Reported associations between elements for logic model: Academic detailing to community-based PCPs can increase referrals to high-performing specialists in open-access care models. The impact varies as a function of delivery method

Wallace 2004[94] Country: UK Study design: RCT Data collection method Aim: To test the hypotheses that virtual outreach would reduce offers of hospital follow-up appointments and reduce numbers of medical interventions and investigations, reduce numbers of contacts with the health-care system, have a positive impact on patient satisfaction and enablement, and lead to improvements in patient health status Detail of participants (number, any reported demographics): 134 GPs from 29 practices and 20 consultant specialists	Method: A RCT comparing joint teleconsultations between GPs, specialists and patients with standard outpatient referral Control: Usual care Length of follow-up: The patients were followed 6 months after their index consultation Response and/or attrition rate: 3170 patients were referred, of whom 2094 consented to participate in the study and were eligible for inclusion. In all, 1051 patients were randomised to the virtual outreach group and 1043 to standard outpatient appointments Context (from what/who to what/who): GP to specialists	Outcome measures: Hospital follow-up appointments Numbers of medical interventions and investigations Numbers of contacts with the health-care system Patient satisfaction and enablement Patient health status	Main results: 52% of patients in the virtual outreach group were offered a follow-up appointment, compared with 41% in the standard outpatient group Per-protocol analysis: The overall proportion of patients receiving an offer of follow-up was 46% in the virtual outreach group and 42% in the standard outpatient group (OR 1.19, 95% CI 0.99 to 1.44), but significant heterogeneity remained for both site and specialty ($p = 0.001$ and $p < 0.001$, respectively) Fewer tests and investigations were ordered in the virtual outreach group, by an average of 0.79 per patient In the 6-month period following the index consultation, there were no significant differences overall in number of contacts with general practice, outpatient visits, accident and emergency contacts, inpatient stays, day surgery and inpatient procedures or prescriptions between the randomised groups Patient satisfaction was greater after a virtual outreach consultation than after a standard outpatient consultation, with no heterogeneity between specialties or sites	Reported associations between elements for logic model: Virtual outreach increased follow-up consultation

Watson 2001[32] Country: UK Study design: cRCT Data collection method: NR Aim: To investigate the effect of an in-practice educational session and information pack on GP management of familial breast/ovarian cancer cases Detail of participants (number, any reported demographics): GP principals in 170 practices in Oxfordshire and Northamptonshire	Intervention: Practices were randomised to group A (receiving an in practice educational session plus information pack), group B (receiving an information pack alone) or group C (receiving neither an educational session nor a pack). The pack contained a laminated summary card with simple referral guidelines, a booklet with more detailed background information, and two patient leaflets The educational session lasted 1 hour and was structured around a series of overheads covering the information presented in the pack. Interaction was encouraged. Sessions were conducted by one of two researchers, both experienced in the field of cancer genetics and teaching. Each participant was asked to complete a short questionnaire, which asked for a rating of the session and assessed levels of knowledge and confidence before and after the session, using a four-point Likert scale. Session participants were told that they would be sent a follow-up questionnaire, but no details regarding the content of this questionnaire were provided Number of hours: NA Delivered by who? Experienced researchers Control: Group C above Length of follow-up: The interventions were conducted between March and November 1999 Response and/or attrition rate: Of the 688 GPs, 426 (62%) participated Context (from what/who to what/who): Primary care referral to oncology for familial breast/ovarian cancer	Outcome measures: Proportion of GPs making the correct referral decision on at least five out of six family history vignettes. GPs' reported confidence in managing patients with a family history of breast/ovarian cancer, measured by a score that was generated by combining responses to four questions	Main results: There was a 40% (95% CI 30% to 50%, $p < 0.001$) improvement in the proportion of GPs who made the correct referral decision on at least five out of the six vignettes in group A (79%) compared with the control group (39%) and a 42% (95% CI 31% to 52%, $p < 0.001$) improvement in group B (81%) compared with the control group (39%). There was no significant difference between groups A and B (table 1). Groups A and B performed better than group C for each of the six vignettes. Group C had most difficulty with vignette 5 (a family history on the father's side). Exclusion of this vignette from the analysis did not change the overall finding. There was almost complete agreement between risk assessment and referral decisions across all three groups; i.e. where risk was assessed as low, GPs indicated they would not refer and where risk was assessed as higher, GPs indicated they would make a referral. Sixty-seven per cent (95% CI 60% to 75%) of GPs in group A, 75% (95% CI 68% to 83%) of GPs in group B, and 16% (95% CI 10% to 21%) of GPs in group C reported using guidelines when answering all/some of the vignettes. The difference in proportions using guidelines was not statistically significant ($p = 0.11$) There was a significant trend in levels of confidence, with GPs in group A (mean confidence score = 2.3) reporting greater confidence than those in group B (mean confidence score = 2.0), who in turn reported greater confidence than those in group C (mean confidence score = 1.5, $p < 0.001$)	Reported associations between elements for logic model: Providing GPs with an information pack significantly improved referral decisions regarding patients with a family history of breast/ovarian cancer

Watson 2002[152] Country: UK Study design: Audit Data collection method: retrospective case note review Aim: Evaluated the impact of introducing a multidisciplinary single point of referral system for dedicated adult learning disability health services Detail of participants (number, any reported demographics): NR	Intervention: A retrospective case note review comparing referrals to a single-point referral system with those to the old referral system The single-point referral system used common referral criteria and a streamlined information system. A new referral form and information leaflet were developed and copies distributed to social workers, data centre managers, GPs and colleges of further education Number of hours: NA Delivered by who? Single-point referral co-ordinator Control: None Length of follow-up: NR Response and/or attrition rate: NR Context (from what/who to what/who): Social workers, data centre managers, GPs to dedicated adult learning disability health services	Outcome measures: Waiting time for referral Inappropriate referral	Main results: With the introduction of the single-point referral system, the mean waiting time for referral to assessment was reduced from 46 (15–67) days to 6 (2–9) days. The proportion of inappropriate referrals halved from 26% to 13%. The proportion of appropriate referrals that involved more than one dedicated learning disability health professional increased from 63% to 80%	Reported associations between elements for logic model: The single-point referral system facilitated prompt allocation of referrals to the appropriate professionals with significant reduction in waiting times

West 2007[52] Country: UK Study design: Before-and-after Data collection method: Audit of GP records and feedback questionnaire Aim: To assess the impact of written guidelines on GP referrals to an orthopaedic outpatient department Detail of participants (number, any reported demographics): NR	Intervention: All GP referral letters for new patients with the chosen conditions in a 13-week period were audited. Letters referring patients for six specific orthopaedic complaints, namely anterior knee pain, back pain, carpal tunnel syndrome, in-toeing in children, sciatica and tennis elbow, were selected. Paper copies of referral guidelines produced by orthopaedic consultants were then distributed to all local GPs After a period of 4 weeks for distribution, the process was repeated for a further 13 weeks. Each letter was analysed for its content of therapy or management already tried by the GP prior to referral, as suggested in the guidelines. GPs were unaware that a referral letter audit was being undertaken. A feedback questionnaire was sent to GPs in the Swindon Primary Care Trust to assess the distribution and use of the guidelines Number of hours: NA Delivered by who? NA Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to orthopaedics	Outcome measures: Referral quality	Main results: In total 471 referral letters were assessed: 304 before the provision of guidelines and 167 afterwards The first 13-week period had 195 (64%) referrals that consisted of patients either who had not received the recommended management, or for whom this had not been mentioned in the referral letter. The second period had 103 (61%) There was no statistically significant difference ($p = 0.49$) and therefore little evidence that the implementation of guidelines had an effect on the management of patients prior to referral or the consequent timing of seeking specialist opinion	Reported associations between elements for either: The provision of orthopaedic written referral guidelines to GPs does not affect the pre-referral management of patients, or the overall number of referrals to the specialty

White 2000[142] Country: UK Study design: Cross-sectional survey Data collection method: Questionnaire Aim: To evaluate the impact of counsellors in primary care on referrals to mental health services Detail of participants (number, any reported demographics): NR	Intervention: Looked at the impact of counsellors in primary care. No new intervention Number of hours: NA Delivered by who? NA Control: NA Length of follow-up: NA Response and/or attrition rate: 91.1% or practices responded Context (from what/who to what/who): general practice to mental health services	Outcome measures: Referrals to mental health services	Main results: A counsellor was present at 20.3% of practices A random sample of 180 referrals to CMHTs was reviewed: 76 (42.2%) from practices that employed and a counsellor, and 104 (57.8%) from practices that did not There was a significantly higher referral rate from practices that employed a counsellor ($p = 0.003$). There was no evidence of a difference in rates of appropriateness of referrals between practices that employed a counsellor and those that did not	Reported associations between elements for logic model: Practices employing counsellors had significantly higher rates of referral to mental health services, with no difference in the level of appropriateness between the two
White 2004[61] Country: UK Study design: Audit Data collection method: Referral letters Aim: To improve communication between GPs and CMHTs Detail of participants (number, any reported demographics): Patients newly referred to two inner-city CMHTs	Intervention: Following a bench-mark audit of a random sample of referrals and assessment letters, locally agreed good practice protocols were developed and shared widely accompanied by a dissemination and implementation strategy Control: None Length of follow-up: 2 years Response and/or attrition rate: NA Context (from what/who to what/who): GP to mental health	Outcome measures: Referral letter content	Main results: Significant improvements occurred in both the GP and the CMHT letters; these were most dramatic after 1 year but tailed off considerably in the second year despite continued efforts to implement the protocol's standards	Reported associations between elements for logic model:

Whited 2002[87] Country: USA Study design: RCT Data collection method: NR Aim: To compare usual care (text-based electronic consultation) with teledermatology (usual care plus digital images and standardised history) Detail of participants (number, any reported demographics): NR	Intervention: Teledermatology – text-based electronic consultation plus digital images and standardised history. History includes demographic information, patient-reported medical history, dermatology history, lesion location, size and duration of presence. The consultant answered the consult by scheduling an appointment, or by relaying a diagnosis and management plan back to the GP Number of hours: NA Delivered by who? GP/dermatologist Control: Usual care (text-based electronic consultation) Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to dermatology	Outcome measures: Time to intervention Referral to (attendance at) dermatology clinic	Main results: Patients in the intervention arm reached time to initial defined intervention sooner than those in the usual-care arm (median 41 days vs. 127 days, $p < 0.001$, log-rank test) 18.5% of patients in the intervention arm avoided the need for a dermatology clinic visit compared with 0 patients in the usual-care arm ($p < 0.001$, z-test)	Reported associations between elements for logic model: This teledermatology intervention resulted in significantly shorter times to initial defined intervention than did a text-based-only electronic consultation. The need to attend for a clinic visit was avoided in some cases, but the appropriateness of this decision was not further considered

Whited 2004[88] Country: USA Study design: Cross-sectional Data collection method: Survey Aim: To assess satisfaction with and acceptance of a store and forward teledermatology system Detail of participants (number, any reported demographics): Patients (135 intervention, 140 control), referring physicians (60) and dermatologists (8)	Intervention: Satisfaction survey as part of a RCT that compared the clinical and economic outcomes of a store-and-forward teledermatology intervention with a conventional referral process Control: Conventional referral process Length of follow-up: NA Response and/or attrition rate: 88% GPs, 75%/66% patient intervention/control Context (from what/who to what/who): GP to dermatology	Outcome measures: Satisfaction Referral	Main results: A majority of referring clinicians (92%) and dermatologists (75%) reported overall satisfaction with the teledermatology consultation process. 95% of referring clinicians reported that teledermatology resulted in more timely referral, and teledermatology patients reached a point of initial interventions than patients receiving conventional referral (41 days vs. 127 days, $p < 0.001$) Teledermatology patients reported satisfaction with the outcome of their consultation 82% of the time, but did not express a clear preference for one consultation method (41.5% preferred teledermatology, 36.5% preferred usual care)	Reported associations between elements for logic model: Teledermatology resulted in more timely referral

Whiting 2011[153] Country: UK Study design: Observational (specific design unclear) Data collection method: NR Aim: To develop a Manchester-wide referral gateway for triage from general practice to specialist care Detail of participants (number, any reported demographics): Pilot with four practices for 5 months, then rolled out city-wide	Intervention: Referrals were electronically screen at three stages using a single standard referral letter template: Stage 1 – GP referrals checked for completeness (NHS number, date of birth, etc.), and checked against local non-commissioned policy Stage 2 – If data are missing, or procedure is not commissioned an electronic advice note is sent back to the GP practice Stage 3 – Clinical triage. Three course of action: referral continues, referral is diverted to an alternative service or advice and guidance from Map of Medicine, NICE or the local commissioner can be sent back to the GP to encourage more work-up or increase management in primary care. This is done within 2 working days Number of hours: NA Delivered by who? The clinical triage work was subcontracted to the out-of-hours provider Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): From GP to eight specialties – general surgery, ophthalmology, cardiology, ENT, trauma/orthopaedics, gynaecology, urology dermatology	Outcome measures: Use of outpatient services GP feedback	Main results: 1.2% reduction in outpatient activity (compared with a 3.8% growth predicted before the intervention). No further data reported (PULSE article) Positive feedback from GPs	Reported associations between elements for logic model: Referral gateway to manage triage from primary care to 8 specialties resulted in a 1.2% reduction in outpatient activity (compared with a 3.8% growth predicted before the intervention)

Wilson 2006[65] Country: UK Study design: cRCT Data collection method: Questionnaires Aim: To evaluate the effectiveness of the intervention in improving GP confidence in managing patients concerned about genetic risk of breast cancer Detail of participants (number, any reported demographics): General practices in the Grampian region of Scotland Linked paper Wilson 2005[65] not extracted separately	Intervention: Components of the intervention software – a list of the key patient information needed in order to use the guidelines. A risk assessment module, presented as a set of short checklists, in which the Scottish referral guidelines for breast, ovarian and colorectal cancer were embedded. Background information on cancer genetics, and explanation of the evidence underlying the guidelines, prepared by local geneticists. Printer-ready, locally customised patient information leaflets. Selected web links for professionals and patients. A contact e-mail link with the Cancer Genetics Service, with a guaranteed response time. Automated production of a draft referral letter using the regionally recommended template. All partners in intervention practices were invited to interactive workshops on cancer genetics designed to complement the software	Outcome measures: GPs' self-reported confidence in four activities related to genetics; rates of referral of patients at elevated genetic risk; and referred patients' understanding of cancer risk factors	Main results: No statistically significant differences were observed between intervention and control arms in the primary or secondary outcomes. A possible effect of the intervention on the proportion of referred patients who were at elevated risk could not be discounted. Only a small proportion of intervention GPs attended the educational session, were aware or the software, or made use of it in practice In the pre-intervention period, intervention GPs were less likely than control GPs to refer patients who were eventually assessed as having elevated genetic risk, with the opposite trend observed in the post-intervention period, although these results did not reach statistical significance	Reported associations between elements for logic model: No convincing evidence of the effectiveness of the intervention was found, probably reflecting barriers to its use in routine practice

	Number of hours: NR Delivered by who? Workshop delivered by specialist genetics staff. Intervention was disseminated by mailing it to all intervention practices; installing it opportunistically with routine practice IT upgrades; special visit by a research associate where requested; and distribution at the educational sessions Control: Control practices received a baseline intervention only (i.e. the Scottish referral guidelines which were mailed to all GPs) Length of follow-up: 31 May 1998 to 31 October 2000 (pre intervention) and 1 July 2001 to 31 May 2002 (post intervention) Response and/or attrition rate: 20 (35%) of the eligible GP practices. 122/140 (87%) of eligible patients (88 intervention, 34 control) Context (from what/who to what/who): GP referral for familial breast cancer	Pre intervention [intervention 40/88 (45), control 22/34 (65), risk ratio 0.70 (95% CI 0.50 to 0.99)] Post intervention [intervention 49/85 (58), control 14/29 (48), risk ratio 1.18 (95% CI 0.88 to 1.37)]

Wolters 2005[36] Country: the Netherlands Study design: RCT Data collection method: Routine data Aim: To determine the effect of a distance-learning programme on general practice management of men with LUTS Detail of participants (number, any reported demographics): 142 GPs showed interest and were allocated to one of the two groups: 70 to the intervention group and 72 to the control group	Intervention: GPs were randomised to a distance-learning programme accompanied with educational materials or to a control group only receiving mailed clinical guidelines on LUTS. Clinical management was considered as outcome The distance-learning programme comprised (1) a package for individual learning developed by the Dutch College of General Practitioners, (2) consultation supporting materials: a voiding diary, the International Prostate Symptom Score and Bother score, (3) the guideline summarised into two decision trees (one on clinical management of LUTS and one on PSA testing) and a brief explanation and (4) two information leaflets for patients (on PSA testing and on treatment for LUTS) Control: The control group of GPs received the existing national guidelines on LUTS Length of follow-up: After fulfilling the intervention (April 2001) GPs were instructed to recruit patients until June 2002 Response and/or attrition rate: The educational programme was completed by 89 of the GPs; 63 GPs (31 GPs in the intervention group and 32 GPs in the control) Context (from what/who to what/who): GP referral to urology	Outcome measures: Number of PSA requests, medication prescribed and the referral rate to a urologist	Main results: Sixty-three GPs registered care management of 187 patients older than 50 years attending the practice because of LUTS The intervention group showed a lower referral rate to a urologist (OR 0.08, 95% CI 0.02 to 0.40), but no effect on PSA testing or prescription of medication PSA testing tended to be requested more frequently by intervention group GPs. Secondary analysis showed patients in the intervention group received more educational materials (OR 75.6, 95% CI 13.60 to 419.90)	Reported associations between elements for logic model: The educational programme had impact on clinical management without changing PSA testing

Wong 2000[81] Country: Hong Kong Study design: Controlled before-and-after Data collection method: Routine data and questionnaire Aim: To evaluate open-access endoscopy for dyspepsia Detail of participants (number, any reported demographics): $n = 367$ patients with dyspepsia in intervention group and 967 control (these numbers change across the paper). Mean age of patients 74 years	Intervention: Family physicians able to arrange upper endoscopy directly with the endoscopy unit in addition to conventional referrals. Extra session each week allocated to open-access requests to ensure waiting time not affected Number of hours: NA Delivered by who? Endoscopy clinic Control: Usual practice Length of follow-up: 2 years 10 months Response and/or attrition rate: NA Context (from what/who to what/who): GP to endoscopy clinic	Outcome measures: Waiting time request to procedure Appropriateness of referral	Main results: Waiting time for intervention group was mean 6 weeks, for control mean 17.5 weeks to consultation and then another 4.5 weeks to procedure = 22 weeks. During this waiting time only antiacids prescribed. Abnormal findings in 19% of patients from intervention group and 22% from consultant referral – difference not significant. Only two patients (0.2%) of those referred via open access were considered inappropriate. No significant difference intervention vs. control in peptic ulcer and cancer detection rate. Significantly more non-ulcer non-cancer abnormal findings in referrals via consultant (0.5% vs. 5%, $p < 0.005$). 13 physicians responded to questionnaire about service, all said it was useful and were willing to use service again, and 11 of 13 said patients satisfied. 107 patients (88%) had telephone interview; all satisfied regarding diagnosis; 76% no further consultation for at least 4 weeks after endoscopy, 12% attended GP; 12% were referred to specialist or were admitted to hospital	Reported associations between elements for logic model: Open access reduces waiting time and subsequent referral to specialists Referral systems similar in terms of diagnostic yield

Wright 2006[56] Country: UK Study design: Controlled before-and-after Data collection method: Referral audit Aim: Before-and-after evaluation of a quality improvement programme for TIA referral with controlled comparison in three PCTs Detail of participants (number, any reported demographics): Three Bradford PCTs and their populations	Intervention: Four local consensus group meetings or relevant stakeholders (including service users and carers) to adapt national guidelines to local context and identify barriers and incentives for changing practice Guideline reminders for clinicians included laminated posters, desktop coasters and electronic referral templates Disseminating guidelines: Education meetings in each PCT Education outreach visits to 19 practices Postal dissemination to other practices not requesting a visit Control: no intervention Length of follow-up: 50 months (28 months before intervention) Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for TIA for stroke prevention (cardiology)	Outcome measures: Referral rates Appropriate treatment	Main results: Significant difference in the change in referral to the rapid access clinic between the practices that were part of the quality improvement programme and those that were not. There was a 41% increase in referrals from trained practices compared with control practices (RR 1.41, $p = 0.018$) Adherence to best practice standards was significantly higher in practices that had received the training programme than in the controls	Reported associations between elements for logic model: Tailored guidelines can be effective

Wylie 2001[18] Country: UK Study design: Audit Data collection method: Questionnaire Aim: To compare the prescribing pattern and attitude of GPs in response to a clinic returning a patient referred for erectile dysfunction to the referrer by two different methods Detail of participants (number, any reported demographics): All 796 referrals for ED on the waiting list were reviewed	Intervention: Referrals on a waiting list for an assessment of erectile dysfunction were reviewed and a subgroup of patients with criteria enabling them to be eligible for a prescription under the NHS were identified. The GP was informed either in writing or by telephone that the clinic had written to the patient, suggesting he make direct contact with his GP. A follow-up questionnaire was sent to each GP 1 month after the initial letter to the patient and contact with the GP Control: NA Length of follow-up: NA Response and/or attrition rate: 91 questionnaires were sent; 66 (73%) completed or partially completed questionnaires were returned Context (from what/who to what/who): GP referral for erectile dysfunction	Outcome measures: Clinical outcomes Attitude of GP Prescribing behaviour	Main results: Of 91 questionnaires sent to GPs, 66 (73%) were completed; an additional five GPs corresponded by letter rather than completing the questionnaire. The long waiting time for assessment had led to 35% of patients having already tried sildenal, and by the time the questionnaire was completed, 57% of patients had tried sildenal. Ten times as many referrers indicated that they were happy to initiate a prescription for sildenal than not to do so, for those men eligible for a NHS prescription More GPs who had received a letter returned the completed questionnaire (80%) than those who had received a courtesy telephone call (64%). There were no differences between the groups of GPs in their attitude to our contact with their patient and no difference in prescribing pattern	Reported associations between elements for logic model: The provision of guidelines and advice to GPs either by telephone or by letter is acceptable practice in reducing long waiting-list times for ED. Safe, simple and effective treatments are available for GPs to use under NHS guidelines

AOR, adjusted odds ratio; CME, continuing medical education; cRCT, cluster RCT; NA, not applicable; NR, not reported; PCP, primary care provider; TIA, transient ischaemic attack.

Non-intervention papers

Abel and Thompson 2011[20] Country: New Zealand Study design: Qualitative Data collection method: Interviews Aim: To examine how guidelines are used Detail of participants (number, any reported demographics): Interviews with 15 GPs and 11 specialists from three largest cities in New Zealand. Selected to reflect a diversity of socioeconomic status patient lists	Method: Qualitative study. In-depth, semistructured interviews with 15 GPs and 11 specialists. Participants were asked for their thoughts on a population-based screening programme, the surveillance guidelines for colorectal cancer, screening, advice to patients at different levels of risk for colorectal cancer, and referrals for colonoscopic investigation. Thematic analysis of interview data Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Use of risk assessment guidelines for colorectal cancer referral	Outcome measures: Views	Main results: Need for flexibility in use of guidelines due to messiness and unpredictability of individual patients Guidelines in their full form little used, sheer size of documents made comprehensive knowledge of all of them difficult for GPs Specialists perceived the guidelines as too complex for GPs to understand GPs argued that the guidelines 'don't quite fit' when they have a patient in front of them. Stories of patients and clinical expertise and judgement incorporated in practitioner decision-making to develop a body of evidence for each individual patient Rigid adherence to guidelines was inappropriate when working for the benefit of the patient. Decision-making more complex than simple objective linear interpretation and implementation of evidence GPs not wanting to miss something by not referring. Emotional or subjective concerns for the patient more relevant than subjective measures of risk GPs saw the task of getting patients seen as their duty to do the best for the patient	Reported associations between elements for logic model: Patient-related factors and referral GP role and referral Lack of adherence to guidelines Risk of missing something

Ache 2011[277] Country: USA Study design: Cross-sectional Data collection method: Survey Aim: To compare attitudes towards hospice referral by doctor ethnicity Detail of participants (number, any reported demographics): 167 white American PCPs and 46 African American PCPs	Method: Survey had 17 questions regarding attitudes to hospice referral Number of hours: NA Control: None Length of follow up: NA Response and/or attrition rate: 51% response rate Context (from what/who to what/who): PCP to hospice	Outcome measures: Demographics and attitudes	Main results: Racial differences in attitude to referral for 5 of 17 questions	Reported associations between elements for logic model: Individual demographics of physician influences referral
Ahluwalia 2009[214] Country: USA Study design: Cross-sectional Data collection method: Survey of PCPs Aim: To examine physician factors associated with referral to outpatient palliative care Detail of participants (number, any reported demographics): $n = 145$ PCPs and internal medicine physicians at two hospital-based not-for-profit health maintenance organisations. 43% 30–39 years; 58% female; 45% experience with PC; 69% referred patients in previous year	Methods: Survey based on literature on referral patterns, included demographics, belief about ability to deliver palliative care, perceived benefits and importance of practice autonomy. Beliefs measured on 20-item scale developed for study Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: 170 of 345 staff asked to complete of these 85% completed Context (from what/who to what/who): Physicians to palliative care	Outcome measures: Beliefs in benefits, beliefs regarding physician autonomy, beliefs regarding ability to provide palliative care	Main results: 70% of respondents reported referring patients to the palliative care programme in the prior year One factor associated with referral: Working at the organisation for more than 10 years compared with less than 10 years (OR 6.29, 95% CI 1.38 to 28.6) Having personal experience with palliative care was not statistically significant (OR 2.13, 95% CI 0.95 to 4.976). None of the beliefs associated with referral	Reported associations between elements for logic model: Working at an organisation for a longer length of time associated with referral

Albertson 2000[270] Country: USA Study design: Cross-sectional Data collection method: Patient survey Aim: To explore patient desire for referral Detail of participants (number, any reported demographics): 12 PCPs for 822 patient visits. Patients seen at a University Medical Group Practice. Included state employees, health-care workers, physicians, nurses, university employees and their family members	Methods: Patients given pre- and post-visit questionnaire, providers surveyed after patient visit Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: Not reported Context (from what/who to what/who): PCP referral. Referral for emergent or urgent care, pregnancy, cancer, mental health, acquired immunodeficiency syndrome (AIDS), annual eye examination, or continuing therapy were excluded	Outcome measures: Perceptions of referral Rating of health, recognition of referral desire	Main results: Provider recognition of a patient referral desire varied significantly within the practice. Between 68% recognition and 24% No relation between PCP age, gender, years in practice, clinic workload, and this variability in recognition of patient referral desire Providers more likely to recognise a referral desire in patients who were healthcare workers or family members, those with more than one referral desire and patients who had a definite desire rather than a possible desire for referral No association with patient self-rating of health, worry regarding referral desire, or self-reported lower functional status related to their referral desire, duration of patient–provider relationship and provider recognition of a referral desire Patients were significantly more likely to have initiated the referral discussion when they had seen the PCP previously and had more than one referral desire. There was a trend for patient initiation of the referral discussion when the patient had known the PCP for more than a year ($p = 0.08$) The frequency with which a referral was made was comparable with patient initiated and PCP initiated referral discussions PCPs felt around 14% of patient referral desires were not indicated	Reported associations between elements for logic model: Variability amongst PCPs regarding whether or not they recognise a referral desire in a patient Continuity of care and familiarity with their PCP is associated with patients initiating a referral discussion with their PCP

Alexander 2008[308] Country: Australia Study design: Cross-sectional Data collection method: Survey of GPs Aim: To identify needs of GPs regarding referral and treatment of patients with mental health disorders Detail of participants (number, any reported demographics): 38 GPs rural New South Wales; average age 47 years; practised 18 years	Methods: Postal survey Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: 26% Context (from what/who to what/who): GP to mental health services	Outcome measures: Rating scale of self-confidence Reported constraints on referral	Main results: 76% reported insufficient skills to provide best patient care as main reason for referring to specialist service Appropriate specialist services being neither available nor accessible was the main factor reported as preventing them referring patients Patient reluctance to accept referral also reported Lack of service targeting children and adolescents a factor preventing referral	Reported associations between elements for logic model: GP knowledge and referral
Allareddy 2007[232] Country: USA Study design: Qualitative Data collection method: Focus groups Aim: To understand relationships between GPs and chiropractors Detail of participants (number, any reported demographics): Carried out two focus groups, does not provide number of participants	Methods: Qualitative analysis of focus groups Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to chiropractice	Outcome measures: Views	Main results: Key to establishing positive relationships is communication. Good elements of communication include feedback, promptness and constructive criticism Telephone call or face-to-face contact was important in influencing positive relationships PCPs expressed a lack of understanding of chiropractic care and did not have any relationship with practitioners. PCPs felt that geographical constraints prevented relationships being established Concern from PCPs regarding level of training of chiropractors, whether or not licenced	Reported associations between elements for logic model: Importance of the referral relationship, communication and confidence in specialist service

Angstman 2009[184] Country: USA Study design: Survey Data collection method: e-mail Aim: To assess provider satisfaction with viral specialist consultations via an e-mail survey Detail of participants (number, any reported demographics): 56 family medicine providers	Methods: E-mail survey Length of follow-up: none Response and/or attrition rate: Context (from what/who to what/who): Viral specialist consultations	Outcome measures: Provider views	Main results: Approximately 30% of the 56 family medicine providers had not tried the viral consultation system after it had been in place for over a year, or said they often forgot that viral consultations were an option; most of the providers surveyed (73%) felt that viral consultations provided good medical care A majority felt that viral consultations are a cost-effective and efficient tool for our department (65%). Most specialists (81%) reported that viral consultations were an efficient use of their time and 67% said that viral consultations were less disruptive than contacts by telephone or pager Only 5% felt that viral consultations do not provide good medical care Specialists providing viral consultations tended to be supportive	Reported associations between elements for logic model: Illustrates the potential for increased efficiency from viral consultation

Anthony 2010[208] Country: USA Study design: Qualitative and cross-sectional Data collection method: Interviews followed by a survey Aim: To investigate factors influencing decisions to refer Detail of participants (number, any reported demographics): 40 physicians, 15 general internists, 15 PCPs, 10 adult/family nurse practitioners, 27 female, 13 male, 25 Caucasian, 39 urban area, years in practice 1–35 years	Methods: Mixed methods – cross-sectional survey and qualitative interviews Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): PCPs to depression care	Outcome measures: Themes Depression Care Questionnaire Provider Belief Survey	Main results: Decisions to refer centred around five main themes Clinicians' perceived severity of symptom Clinicians' comfort in treating depression – identified by 80% as a very important factor Clinicians' perceived complexity of the diagnosis (comorbid diagnosis or a lack of patient response to medication) Patient preference and resources – willingness to see a mental health specialist, ability to pay Practice environment (time constraints, treatment resources, access to specialists)	Reported associations between elements for viral consultation: Patient factors influencing referral Clinician confidence

Ashworth 2002[303] Country: UK Study design: Cross-sectional Data collection method: Analysis of referral records Aim: To explore whether or not having an on-site mental health worker impacted on referral Detail of participants (number, any reported demographics): 29 practices in inner-city London. 79 GPs. 622 referrals made. 72% had on-site worker with mean of 1.6 hours per week per 1000 patients	Methods: All referrals over period of 1 year and case notes of those referred searched to exclude those with psychotic illness Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to psychiatry for non-psychotic patients	Outcome measures: Referral rate Allocation of mental health workers	Main results: Rates varied almost 10-fold between different practices No significant correlation between psychiatric referral rates for non-psychotic illness and the allocation of mental health workers to each practice (Spearman's $p = -0.22$, $p = 0.25$) If practices in the highest quartile or quintile of referring rates were analysed there was a possible relationship between referral and worker. These practices with higher referral rates had lower allocations of mental health workers (Mann–Whitney U-test = 30.0/38.0, $p = 0.03$ and 0.04) No other factors associated with referral rate such as being a single-handed practice, non-fundholding, or inability to meet health screening targets, percentage of patients unemployed or with long-term sickness	Reported associations between elements for logic model: Presence of mental health worker and mental health referral

Baker 2006[192] Country: UK Study design: Qualitative Data collection method: Interviews with GPs Aim: To explore variation rates in GP referral rates Detail of participants (number, any reported demographics): 29 GPs with high and low referral rates in north-east of England. 24 male, 26 urban areas, 17 more than 20 years qualified	Method: Qualitative, semistructured interviews with 29 GPs. Thematic analysis of interview data Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: 53% response rate Context (from what/who to what/who): GP to lumbar spine radiography	Outcome measures: Themes High vs. low use of radiography from radiology records	Main results: Content of the available guidelines was perceived as appropriate and limitations of radiography acknowledged by both groups. Both high and low users were aware of the guidelines. Radiography seen by some as being used to allay fears of a serious illness such as cancer. GPs also influenced by patient social and economic circumstances in regard to whether refer urgently or watchful waiting approach High-use GPs tended to view use of radiography as a legitimate means to reassure patients with benefit outweighing risk more than lower users. Lower users described more complex impact of findings GPs in higher user group tended to be more pessimistic regarding options available and the prognosis for chronic back pain sufferers Higher emphasis on fragility of doctor–patient relationship in higher user group and use of radiography to preserve this relationship Concern regarding exposure to radiation expressed more in lower referral group. Those who referred far more were less concerned. Some report of cost concerns radiography in lower user group 9 of 14 high-user GPs perceived their use as low or were unsure of their use level. Lower use group judged their use more accurately	Reported associations between elements for logic model: Individual beliefs of GP and referral Self-perception of referral rates

Balduf 2008[274] Country: USA Study design: Cross-sectional Data collection method: Postal survey Aim: To assess the attitudes, knowledge, and bariatric referral practices among family and internal medicine physicians in North Carolina Detail of participants (number, any reported demographics): 47% of 611 randomly chosen PCPs returned a self-completed questionnaire	Method: Survey of PCPs Control: NA Length of follow-up: NA Response and/or attrition rate: 47% Context (from what/who to what/who): GP to specialist	Outcome measures: The effect of demographics, PCP attitudes, and PCP knowledge on referral practices was evaluated	Main results: Over 85% (221) of PCPs have treated operated bariatric patients within the last year and 76% (203) have referred patients for surgical evaluation Thirty-five per cent of practitioners felt unprepared to provide good-quality long-term medical care to operated patients, and just 45% felt competent to address medical complications of bariatric surgery Compared with non-referring PCPs, referring physicians provided medical care to a greater number of severely obese (mean 9.9 vs. 7.5, $p < 0.001$) and post-operative (mean 4.6 and 2.3, $p < 0.001$) bariatric patients. Referring providers were younger (46 vs. 49, $p = 0.02$), had higher body mass index (25.3 vs. 23.5, $p < 0.001$), were more familiar with NIH guidelines (14.7% vs. 3.0%, $p = 0.02$), and had completed more bariatric continuing medical education (49.8% vs. 34.9%, $p = 0.03$). In addition, they reported better resources (71.4% vs. 35.4%, $p < 0.001$) and competency to provide good-quality long-term care to post-operative bariatric patients (54.2% vs. 15.4%, $p < 0.001$) than non-referring peers	Reported associations between elements for logic model: Unclear

Barnett 2011[222] Country: USA Study design: Cross-sectional Data collection method: Web-based survey Aim: To examine reasons for choosing colleagues to refer to Detail of participants (number, any reported demographics): *n* = 386 physicians, 64% male, 36% PCP physicians	Method: Participants presented with roster of other physicians names who had been identified by the participant as being in their professional network. Respondents reported if they referred to these physicians and if so asked for up to two reasons why Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: 63% Context (from what/who to what/who): PCP and specialist physicians to specialist services	Outcome measures: Referral destination physician and factors underpinning choice	Main results: PCPs initiated referrals to 66% of their professional network colleagues PCPs likely to cite reasons relating to patient access or physician communication when comparing specialists. PCPs – timely availability of appointments cited as factor in 15.7% of their referral relationships. Shares my medical record system 17.9% Note: Focus of paper findings is comparison between PCPs and specialists	Reported associations between elements for logic model: PCP referral decisions influenced by between-physician communication and patient access

Bederman 2010[196] Country: Canada Study design: Delphi consensus Data collection method: An expert panel of primary and specialist physicians, using a Delphi process, came to a consensus on referral recommendation from clinical practice guidelines based on a series of clinical vignettes Aim: To compare the actual referral practices for patients with degenerative disease of the lumbar spine with recommendations for surgical referral based on clinical practice guidelines and family physician opinions Detail of participants (number, any reported demographics): Panel $n = 10$	Method: An expert panel of primary and specialist physicians, using a Delphi process, came to a consensus on referral recommendations from clinical practice guidelines based on a series of clinical vignettes. The vignettes were also presented to practising family physicians in Ontario, Canada, to determine their preferences for (or likelihood of) referral The panel was a 10-member multispecialty expert panel Practising family physicians were randomly sampled, stratified by county, and their patients were sampled purposefully by the family physician Context (from what/who to what/who): Primary care referral practices for patients with degenerative disease of the lumbar spine	Outcome measures: Respondents, both panellists and family physicians, were asked to rate the appropriateness of surgical referral for a series of clinical vignettes. Patients reported their clinical symptoms and whether or not they had been referred to a surgeon. Using random-effects probit regression, redictions were compared with actual referral. Receiver operating characteristic curves were constructed and area under the curve was measured	Main results: Consensus of the panel on recommendations for referral was achieved after two iterations (Cronbach 0.96). Based on responses from 107 patients and 61 family physicians, we found poor concordance of both predicted family physician preferences (area under the curve 0.57) and clinical practice guidelines recommendations (area under the curve 0.64) with actual referral	Reported associations between elements for logic model: Referral practices are poorly predicted by clinical practice guideline recommendations and individual family physician opinions

Beel 2008[226] Country: Australia Study design: Qualitative Data collection method: Semistructured interviews Aim: Investigating GPs' views on psychologists and the factors that determine patient referral Detail of participants (number, any reported demographics): 12 Western Australian GPs from the Perth metropolitan area (eight men and four women, aged 30–79 years)	Method: GPs in Australia typically do not refer clients to mental health-care providers. Few systematic and referenced studies of the reasons for this lack of collaboration have been identified. The current research addresses this gap by investigating GPs' views on psychologists and the factors that determine patient referral Control: NA Length of follow-up: NA Response and/or attrition rate: Context (from what/who to what/who): GP to psychology	Outcome measures: Practitioner views	Main results: The main findings were that GPs were satisfied with psychologists' capabilities but not their professional communications and were overwhelmingly dissatisfied with a mental health system that does not readily provide funding for patients in need of mental health-care services The findings suggest that GPs would like health-care policies to be more inclusive of psychological services and are interested in collaborating with psychologists for better patient outcomes	Reported associations between elements for logic model: Influence of good communication from specialist back to referrer in referrer satisfaction
Bekkelund 2001[259] Country: Norway Study design: Cross-sectional Data collection method: Survey Aim: To explore satisfaction with self-referral Detail of participants (number, any reported demographics): 1052 patients examined by a neurologist for headache in previous 2 years	Method: Cross-sectional survey Control: NA Length of follow-up: NA Response and/or attrition rate: 75% Context (from what/who to what/who): Doctor to neurologist	Outcome measures: Views	Main results: 24% initiated the referral themselves 52% of those were dissatisfied with the specialist consultation 42% of those referred by the doctor were dissatisfied with the consultation	Reported associations logic model: Less patient satisfaction with self-referral than with doctor referral

Belgamwar 2011[197] Country: UK Study design: Retrospective cross-sectional Data collection method: Routine data analysis Aim: This study examines the current practice in an urban area with particular reference to primary care management of anxiety and depression. It specifically looks at the stepped care model recommended in the NICE guidelines and identifies the improvements that should be made to patients' care in the future Detail of participants (number, any reported demographics): 204 referrals from seven GP practices. Of these, 64 GP referrals (31%) mentioned primary problems such as anxiety and depression	Method: Examined all GP referrals to our community general adult mental health services (CMHT), covering a population of 38 000, during the period of June 2008-March 2009. Referrals were assessed for adherence to NICE guidelines, specifically monitoring standards against the stepped care model in patients suffering from anxiety and depression. They examined what care had been given to these patients in primary care prior to their referrals to secondary care mental health services The stepped care model provides a framework for appropriate patient care at different stages of their illness. If the patient does not benefit from an intervention, then one from the next step in the model should be offered (NICE) Context (from what/who to what/who): GP referral for anxiety/depression	Outcome measures: Appropriateness of referral (stepped care model)	Main results: Exactly half of all referrals (32/64) did not follow the stepped care model. Of these, the majority of patients (28/32, 87.5%) had not received any psychological therapy prior to referral to secondary services (or at least this was not mentioned in GP letters). Only one GP had commented on the use of self-help strategies. On the other hand, only a minority of patients (4/32, 12.5%) had not been tried on medication before being referred to secondary care mental health services	Reported associations between elements for logic model: GPs may not be aware of NICE stepped care recommendations. Education/awareness-raising is needed

Berendsen 2007[237] Country: the Netherlands Study design: Qualitative Data collection method: Semistructured interviews Aim: What motivates GPs to initiate and continue participating with medical specialists in new collaborative care models Detail of participants (number, any reported demographics): 21 Dutch GPs	Method: A qualitative study design was used. Starting in 2003 and finishing in 2005. Conducted semistructured interviews with a purposive sample of 21 Dutch GPs. The sampling criteria were age, gender, type of practice and practice site. The interviews were recorded, fully transcribed, and analysed by two researchers working independently. The resulting motivational factors and preferences were grouped into categories Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP referral to specialists	Outcome measures: Factors which encourage participation	Main results: Developing personal relationships' and 'gaining mutual respect' appeared to dominate when the motivational factors were considered. Besides developing personal relationships with specialists, the GPs were also interested in familiarising specialists with the competencies attached to the profession of family medicine Additionally, they were eager to increase their medical knowledge to the benefit of their patients. The GPs stated a variety of preferences with respect to the design of new models of collaboration	Reported associations between elements for logic model: Developing personal relationships with specialists appeared to be one of the dominant motives for increased collaboration

Berendsen 2010[262] Country: the Netherlands Study design: Cross-sectional Data collection method: Survey Aim: To explore patient preferences for transition from primary to secondary care Detail of participants (number, any reported demographics): Patients – 513 survey 1, 1404 survey 2. 61% female, 59% 35–64 years old Patients over 18 years and who had been referred to a medical specialist in the last 2 years. Patient groups defined as stressed or stable	Methods: Two questionnaires sent, one on perceived importance of care and the other on experiences of care Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: 69% response rate for questionnaire 1 (Importance), 65% response rate for questionnaire 2 (Experience) Context (from what/who to what/who): Referrals to medical specialist excluding paediatrics and psychiatry	Outcome measures: Views and perceptions	Main results: 81% of patients thought it was important that the GP gave them advice on which hospital or specialist to go to when they referred the patient. For 67% of patients the GP gave this advice 25% of patients found it important that the GP decided for them which hospital or specialist to attend. In 33% of cases the GP had done that Older people more than younger people (65 + 38%, < 65 20%, $p = 0.001$) and lower educated (42%) more often than higher educated people (19%, $p < 0.0005$) wanted the GP to make a decision. In practice the GP tended to make the decision more for lower educated people more often No difference men and women regarding role of GP 70% of patients thought it important they chose a hospital themselves, 56% a specialist. 61% actually did choose the hospital, 30% a specialist 91% wanted to choose a hospital based on proximity. Patients aged 75 and older more often wanted to choose a hospital nearby. No difference in choice of hospital nearby based on educational level, chronic illness A small number of patients wanted to choose a hospital or specialist based on information from a newspaper, the internet or a health insurance company. Patients with a curable condition, aged between 25 and 65 years, who are highly educated and have a high score on the stable scale more often wish to use information from newspapers or the internet to make a decision	Reported associations between elements for logic model: Patient preference for GP to make referral choice Patient demographics of those who use information to make choice Role of GP as decision-maker Demographics of patients who wished to be involved in decision Proximity of service important Own/family experiences important

Bertakis 2001[264] Country: USA Study design: Cross-sectional Data collection method: Data analysis Aim: Examines factors predictive of patient referrals to specialists by primary care residents Detail of participants (number, any reported demographics): $n = 509$, 38% were men. Ethnic backgrounds of the patients included Caucasian (63%), African American (22%), Hispanic (8%), Asian (4%) and Native American (3%). Patients had a mean age of 41.3 years and a median of 12 years of education	Method: New adult patients ($n = 509$) were randomly assigned to primary care residents at a university medical centre. Patient referrals to specialists were monitored for 1 year of care Self-reported patient health status, sociodemographic information, number of primary care visits, and physician practice style behaviours were incorporated into statistical analyses predicting specialty referrals Control: NA Length of follow-up: 1 year Response and/or attrition rate: 821 patients out of 956 (85%) agreed to participate, 312 (38%) were excluded for various reasons. 53% of those invited made it through to the final data set Context (from what/who to what/who): GP to specialist	Outcome measures: Self-reported patient health status, sociodemographic information, number of primary care visits, and physician practice style behaviours	Main results: Patients who were referred to specialty care were significantly older, had poorer physical health and saw their primary care physicians more often than patients who were not referred. Patients were most frequently referred to surgical specialty clinics The majority of specialty referrals were made by the patients' primary care physicians. Of the 1105 specialty clinic visits, 752 (68.1%) were at the request of the patients' primary providers, 157 (14.2%) were initiated by other providers in the same primary care clinic, and another 196 (17.7%) were instigated by providers in non-primary care clinics After controlling for physical health status, gender and age, more frequent visits to a primary care resident physician who had a technically oriented style of care was associated with a greater total number of specialty clinic referrals There were more medical specialty referrals for patients having poorer physical health ($p = 0.01844$), advanced age ($p = 0.0002$), and a larger number of primary care visits ($p = 0.0001$) More primary care visits ($p = 0.0001$) and a primary care physician practice style emphasising the technical aspects of medical care ($p = 0.0410$) all significantly influence the total number of specialty clinic referrals	Reported associations between elements for logic model: Unclear

Blundell 2010[253] Country: UK Study design: Qualitative Data collection method: Semistructured interviews Aim: To explore interpretations of 'appropriate' and 'inappropriate' elective referral from primary to secondary surgical care among senior clinical and nonclinical managers in five purposively sampled PCTs and their main associated acute hospitals in the English NHS Detail of participants (number, any reported demographics): $n = 22$	Method: Semistructured face-to-face interviews were undertaken with senior managerial staff from clinical and non-clinical backgrounds. Interviews were tape-recorded, transcribed and analysed according to the Framework approach developed at the National Centre for Social Research using N6 (NUD*IST6) qualitative data analysis software Response and/or attrition rate: 22 of 23 participated (between three and five respondents per PCT and associated acute hospital) Context (from what/who to what/who): Elective referral from primary to secondary surgical care	Outcome measures: Appropriateness of referral	Main results: Three attributes relating to appropriateness of referral were identified – necessity (whether a patient with given characteristics was believed suitable for referral); destination or level (where or to whom a patient should be referred); and quality (or process) (how a referral was carried out, including e.g. investigations undertaken before referral, information contained in the referral and extent of patient) Involvement in the referral decision. Attributes were hierarchical. 'Necessity' was viewed as the most fundamental attribute, followed by 'destination' and, finally, 'quality'. In general, but not always, all three attributes were perceived as necessary for a referral to be defined as appropriate	Reported associations between elements for logic model: Three hierarchical attributes (necessity, appropriateness of destination and quality of referral process) contributed to the overall concept of appropriateness of referral from primary to secondary surgical care

Blundell 2011[189] Country: UK Study design: Survey Data collection method: Online, telephone, fax or post Aim: To investigate GPs' attitudes to guidelines for elective surgical referral in England. To understand their use of guidelines, and attitudes to shared decision-making in the referral decision Detail of participants (number, any reported demographics): Stratified random sample 30% ($n = 310$) drawn from GP lists of 10 English health districts	Response and/or attrition rate: Responses were representative of GPs in England, but (despite up to six contacts per non-responder) the overall response rate was 41.6% ($n = 129$; with the range across PCTs of 25–61%) Context (from what/who to what/who): Guidelines for referral for elective surgery	Outcome measures: Practitioner views Support for use of guidelines	Main results: Most responding GPs indicated support for referral guidelines but 18% reported that they had never used them. Less than 3% reported use for most or all referral decisions. The odds of using guidelines decreased with increasing age, with a ten year increase in age associated with halving odds of use (OR 0.53, 95% CI 0.29 to 0.90) Over 50% of GPs wanted good access to electronic guidelines with expert information and advice on guideline availability. Almost all (> 89%) GPs agreed with sharing referral decisions with patients Female doctors (OR 5.2, 95% CI 1.02 to 26.3) were more likely to agree with this than male GPs as were those working in larger compared with small or single-handed practices (OR 5.3, 95% CI 1.4 to 19.9)	Reported associations between elements for logic model: This group of responding GPs was supportive of guidelines but used them in different ways. Referral guidelines should have an educational component for background reading; include key messages for internalisation and application; and incorporate mechanisms to facilitate accessibility and appropriate shared decision-making with patients
Bolanos-Carmona *et al.* 2002[276] Country: Spain Study design: Cross-sectional Data collection method: Examination of patient record data Aim: To explain variability in health service by patients Detail of participants (number, any reported demographics): Data from 52,152 patients and their 38 primary care physicians. Average age of physician 40 years; 66% men	Methods: Cross-sectional examination of patient record data Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): All specialties	Outcome measures: Ambulatory care group and physician characteristics	Main results: Most of variability in referral numbers was due to patient characteristics (97%) while only 3% was related to physicians – ambulatory care group and post that physicians hold in their health centre (director or not). The average number of referrals per patient per year was 0.13 times greater for health centre directors than for physicians No effect of physician age, gender, minutes devoted to patient Paper does not examine specific patient characteristics	Reported associations between elements for logic model: Lack of association between physician characteristics and referral Predominance of patient characteristics impacting on referral variance

Boulware 2006[304] Country: USA Study design: Cross-sectional Data collection method: Questionnaire Aim: Do PCPs and specialists agree on diagnostic and referral strategies, and identify similar barriers to caring for patients? Detail of participants (number, any reported demographics): National sample of 304 physicians 126 nephrologists, 89 family physicians, and 89 general internists	Method: A national study of PCPs and nephrologists in the USA through a questionnaire describing a PCP caring for a patient with progressing chronic kidney disease and questions to assess recognition of kidney dysfunction and approaches to diagnostic evaluation and referral Control: NA Length of follow-up: NA Response and/or attrition rate: Nephrologists (39% response rate, family physicians 28% response rate, and general internists 28% response rate) Context (from what/who to what/who): GP to nephrology	Outcome measures: Participant and patient characteristics independently associated with kidney disease, recognition and referral	Main results: PCPs recognised chronic kidney disease less (adjusted percentage 59%; 95% CI 47% to 69%, family physicians; adjusted percentage 78%; 95% CI 67% to 86%, general internists; adjusted percentage 97%; 95% CI 93% to 99%, nephrologists; $p < 0.01$), differed from nephrologists in their recommendations for diagnostic testing, and recommended referral less (adjusted percentage 76%; 95% CI 65% to 84%, family physicians; adjusted percentage 81%; 95% CI 70% to 89%, general internists; adjusted percentage 99%; 95% CI 95% to 100%, nephrologists; $p < 0.01$) PCPs differed from nephrologists in their expected intensity of specialists' involvement in care (16%, family physicians; 20%, general internists; 6%, nephrologists recommending nephrologist input monthly to every 6 months; $p < 0.01$). Lack of awareness of clinical practice guidelines and lack of clinical and administrative resources were identified as important barriers to care	Reported associations between elements for logic model: Lack of awareness of clinical practice guidelines and lack of clinical and administrative resources were identified as important barriers to care

Bowling 2000[291] Country: UK Study design: Cross-sectional Data collection method: Questionnaire Aim: To analyse the patterns and process of care for the referral of outpatients, together with the views of patients, their GPs, and specialists Detail of participants (number, any reported demographics): 842 patients	Method: A questionnaire survey of outpatients, their hospital specialists, and GPs in randomly sampled district health authorities in the North Thames Region. The measures included items and scales measuring satisfaction and processes Control: NA Length of follow-up: NA Response and/or attrition rate: The response rates to the study were patients, 74% (982); specialists to the general questionnaire, 100% (34), and to the individual ('new' patients as defined by the hospital) patients' questionnaire, 91% (184); GPs to the general questionnaire, 64% (393), and to the individual (all) patients' questionnaires, 64% (552); and the outpatients' managers, 61% (27) Context (from what/who to what/who): GP to specialists	Outcome measures: Practitioner views Patient views	Main results: Almost all (95%; 800 out of 842 responders) patients thought that their consultation with the specialist was 'necessary', and 89% (851 out of 857 responders) rated it as 'worthwhile'. Consistent with this, of the 540 patients for whom GPs completed the individual patient questionnaire item, 89% (481) were rated by GPs as 'GP not able to give the care, treatment and investigations received in the hospital', although 10% (56) felt that they could have done; 1% (3) were uncertain Most of the GPs felt that they could not have given the study patients the care, treatment and investigations they received in hospital, and most of the sampled patients' attendances were rated by the specialists as 'appropriate' However, for just over one-fifth of new patients, the specialists reported that the GP could have done more tests and examinations prior to referring the study patient. Large proportions of GPs in this survey also reported having technical equipment in their practices, as well as direct access to a range of services and hospital-based facilities	Reported associations between elements for logic model: Differing perceptions GPs and specialists regarding level of pre-referral testing

Bowling 2006[273] Country: UK Study design: Cross-sectional Data collection method: Semistructured interviews Aim: To investigate referral rates for cardiac interventions by clinical specialty, to document doctors' reasons for referrals and to explore doctors' perceptions of the factors that influenced their clinical decisions Detail of participants (number, any reported demographics): 6093 electronic patients with cardiac disease 88 doctors (GPs, care-of-the-elderly specialists, cardiologists) participated in the full study, in seven areas in southern, central and northern England. Complete interview data were analysed for 76 of these	Method: Semistructured interviews about influences on referral decisions Control: NA Length of follow-up: NA Response and/or attrition rate: 76/88 Context (from what/who to what/who): GP referral to cardiology and care of the elderly	Outcome measures: Factors that influences referral decisions	Main results: Not all patients who were eligible for specific investigations or treatment received these. The extent of variations in clinical decisions differed by type of intervention Apart from the general reasons for referrals, doctors raised nine main influences on their actual decision-making. The most commonly reported influence ('barrier') was poor access to equipment for intervention, which increased thresholds for investigation and treatment The nine barriers were lack of equipment, or lack of direct or easy access to equipment, for interventions; insufficient time; budgetary constraints; staffing shortages; the effects of hospital policies or consultant policies/clinical guidelines on criteria for investigation and referral; long waiting lists for referrals; the personal characteristics of consultants referred to; doctors' own characteristics and interests; and patient characteristics	Reported associations between elements for logic model: Unclear

Brien 2008[258] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To explore GP experiences of referral Detail of participants (number, any reported demographics): 10 GPs	Method: Qualitative study. Semistructured interviews with 10 GPs. Thematic analysis of interview data using The Framework Approach Control: NA Length of follow-up: NA Response and/or attrition rate: 30% response rate Context (from what/who to what/who): Referral to a private complementary and alternative medicine clinic	Outcome measures: Views	Main results: GP decisions to refer mediated by their experience, evidence and knowledge of complementary and alternative medicine. Positive reports from patients, friends and colleagues, positive past experiences were influential. Those with less knowledge tended to refer via conventional routes first and only to complementary and alternative medicine once conventional routes had been exhausted. Those with less knowledge tended to refer less Good communication with the complementary and alternative medicine practitioner was important Patient experiences of and attitudes to complementary and alternative medicine vital in the process. A match between the doctor's attitude and treatment preferences and patient views was important	Reported associations between elements for logic model: Patient preferences and referral GP knowledge and referral Relationship with specialist and referral

Bruyninckx 2009[209] Country: the Netherlands Study design: Qualitative Data collection method: Interviews Aim: To identify GP reasons for referring or not referring Detail of participants (number, any reported demographics): 21 GPs reporting decision making in relation to two patients each. Two interviews poorly recorded and not used. GPs – male = 18, mean age 52 years, urban 10, solo practice 9	Methods: Qualitative study. Semistructured interviews with 21 GPs. Thematic analysis of interview data Control: None Length of follow-up: NA Response and/or attrition rate: 85 invited at a meeting further 320 invited by e-mail (17 recruited via group, four via e-mail) Context (from what/who to what/who): GP referral for chest pain (cardiologist or emergency department)	Outcome measures: Description of decision-making	Main results: Referral based on three categories of factors Background knowledge about the patient (e.g. previous history) Differences in patient behaviour – previous to actual consultation Current clinical presentation – having specific pain, frequency and duration, clinical examination, ECG, combination of signs and symptoms – gut feeling GP personal ideas – uncertainty or anxiety, certainty, younger patients referred more readily to emergency department than older, perception by GP of a negative attitude towards GP by staff patient referred to, errors in the past influenced subsequent decisions	Reported associations between elements for logic model: Patient clinical factors together with GP personal factors influenced decision

Burns 2002[301] Country: UK Study design: Ecological (retrospective) Data collection method: Case notes Aim: To investigate the association between deprivation and referral to CMHTs, including the contribution of general practice Detail of participants (number, any reported demographics): All community/outpatient referrals to four CMHTs over 1 year	Method: Retrospective analysis of case notes from all adult psychiatry community and out patient referrals between April 1993 and March 1994 to four CMHTs, and all adult psychiatry in patients during the same year Control: NA Length of follow-up: NA Response and/or attrition rate: Context (from what/who to what/who): GP to CMHC	Outcome measures: Jarmin index of deprivation Referral	Main results: Low correlation was found between referral rates for all diagnoses and the Jarmin index of deprivation and between both the index and admission rates for all diagnoses and non-psychosis Referral from GPs varied nearly 40-fold and were not related to deprivation, fund holding status or having a practice manager or practice nurse In addition, the GP factors investigated did not predict referral (not reported further)	Reported associations between elements for logic model:

Calnan *et al.* 2007[207] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To investigate referral pattern variation for GPs working in out-of-hours care Detail of participants (number, any reported demographics): 15 GPs, five high, five medium and five low referrers. 10 male; mean years since qualifying 19	Methods: Interview plus GPs asked to fill in short questionnaire about personal and background characteristics. Vignette of 80-year-old women with breathlessness presented with alternative scenarios used to stimulate discussion during interview Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GPs (out of hours) to hospital admission (paper refers to intermediate care not emergency)	Outcome measures: Views	Main results: Key element in the decision to admit or not was GP's perspective. Little variation in significance attached to patient clinical condition High-referring GPs tended to be cautious and describe being better to admit if in doubt. They tended to express anxiety about the consequences of a decision. Tended to hold negative attitudes towards alternatives to hospital admission. Saw hospitals as places to be avoided and their role was to prevent admission Low referrers more confident in their decisions and loss often worried afterwards. More willingness to accept a degree of uncertainty. Low referrers more positive about alternatives to hospital and described themselves as able to resist pressure from family or carers Low referrers all male, older and had longer experience	Reported associations between elements for logic model: GP individual beliefs and views linked to referral decisions (for hospital admission)

Carlsen *et al.* 2008[244] Country: Norway Study design: Cross-sectional Data collection method: Survey Aim: To explore whether or not level of congruence in attitude between patient and GP influences referral rate Detail of participants (number, any reported demographics): 56 GPs in Bergen region asked to distribute a questionnaire to 50 of their patients older than age 16. 41 GPs included. Mean age 47.2 years; 66% male; mean list size 1161; mean 13% of consultations resulted in referral range 3.25 to 5.25. 835 patients; mean age 49.3 years; 71% female; three levels of education 2.15%	Methods: Patient questionnaire, GP questionnaire containing information on demographics and practice information Both completed Patient Practitioner Orientation Scale. Difference between patient and GP scores calculated Control: None Length of follow-up: NA Response and/or attrition rate: 46% patient survey Context (from what/who to what/who): GP to specialist	Outcome measures: Level of congruence between patient and practitioner – Patient Practitioner Orientation Scale Demographics Reported referral rate	Main results: Male GP score – mean 4.26, SD 0.45 Female GP score – mean 4.42, SD 0.47 Male patient score – mean 4.38, SD 0.59 Female patient score – mean 4.51, SD 0.58 GP–patient difference score – mean 0.39, SD 0.36, minimum 0 and maximum 1.19 Significant negative correlation between GP score and reported referral rate –0.46, $p = 0.002$, indicating GPs with a preference for patient involvement are less likely to refer No significant correlation between patient score and referral rate. Low correlation between GP and patient score $r = 0.029$, $p = 0.07$ The larger the difference between GP and patient in attitudes towards shared decision-making the higher the referral rate ($p = 0.001$) Patient age, GP age, GP years of experience, patient educational level, list size and number of GPs in practice did not appear to be influential Male GPs had higher referral rates; however, GP gender was not significant	Reported associations between elements for logic model: More the doctor and patient differ in attitude towards patient involvement, the more often GP refers to specialist care GPs who prefer shared decision-making refer less Importance of doctor–patient interaction

Chan 2003[275] Country: Canada Study design: Cross-sectional Data collection method: Physician claims database Aim: Examines the factors affecting referrals by primary care physicians to specialists Detail of participants (number, any reported demographics):	Method: Multilevel Poisson models were used to test the impact of patient-physician- and community-level variables on the referral rate (the number of office-based specialist referrals per patient by the patient's customary primary care physician in fiscal year 1997/98). Patients from each of 6972 PCPs with sufficient data in Ontario were examined Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Referral	Main results: The average patient had 0.56 referrals per year (range 0–61). Referrals were higher at ages 1 and 77 to 78, and among women of childbearing age Chronic disease variables were strongly correlated with referral rates. Patients in poor neighbourhoods had more referrals, because they had more chronic diseases After controlling for disease, individuals in the top 9% wealthiest neighbourhoods had 4% more referrals. Female physicians made 8% more referrals than men. Older physicians referred more because they saw older patients; after controlling for patient age, physician age had no effect Referrals were 14% higher in cities with medical schools compared with other cities and 12% lower in small towns. However, local specialist supply was unrelated to referral rates	Reported associations between elements for logic model:
Chauhan 2012[284] Country: UK Study design: Cross-sectional Data collection method: Admission data (2006–7 and 2007–8) Aim: To identify the characteristics of general practices and patients associated with elective admissions Detail of participants (number, any reported demographics):	Method: Audit of referral data Control: None Length of follow-up: none Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Practice characteristics (list size, distance from principal hospital, QOF score and GP patient access survey data) and patient characteristics (age, ethnicity and deprivation and gender)	Main results: Practices with a higher proportion of patients aged 65 years or older and of white ethnicity had higher rates of elective hospital admissions. Practices with more male patients and with more patients reporting being able to consult a particular GP had fewer elective hospital admissions. For 2007–8, practices with a larger list size were associated with higher elective hospital admissions. QOF performance did not predict admission numbers	Reported associations between elements for logic model: Practice characteristics predict referral

Chen 2005[286] Country: USA Study design: Cross-sectional Data collection method: Patient contact database analysis Aim: To examine the effect of patient characteristics on referral Detail of participants (number, any reported demographics): 251,240 patient encounters in nine clinics resulting in 23,720 referrals	Method: Patient contacts including office visits Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): All specialties	Outcome measures: Referral rate Patient characteristics	Main results: Higher referral rates for male patient encounters (9.95 vs. 9.11, $p = 0.02$) Patients over 65 years and under 18 years less likely to be referred (10.82 vs. 6.73 and 7.24, respectively, $p = 0.001$) Ethnic minority patients less likely to be referred ($p = 0.002$) 19 significant diagnostic groups for referral including likelihood of recurrence, chronic specialty, psychosocial, major/minor symptoms	Reported associations between elements for logic model: Patient demographic and clinical characteristics and referral
Chew-Graham 2008[229] Country: UK Study design: Qualitative study as part of RCT Data collection method: Interviews Detail of participants (number, any reported demographics): GPs, psychiatrists and managers or clinical leads of CMHTs	Methods: Qualitative interviews Control: None Length of follow-up: None Response and/or attrition rate: NA Context (from what/who to what/who): GP to mental health	Outcome measures: Views	Main results: Referral purpose was to access specialist knowledge, which was perceived to lie with a psychiatrist and therefore referral to a team did not allow this access GPs have personal threshold after which they refer to secondary care Personal threshold varies between GPs Lack of direct doctor-doctor communication was perceived to contribute to fragmentation of patient care. Strategies could be used to bypass the team and achieve doctor–doctor communication	Reported associations between elements for logic model: GP discontent with services that operate by referral to a team rather than a specialist hospital consultant Direct doctor to doctor communication a key element of GP satisfaction Different referral threshold of GPs

Chung 2010[305] Country: USA Study design: Cross-sectional Data collection method: Database analysis Aim: To compare referral patterns by PCPs with nurse practitioners and assistants with those without Detail of participants (number, any reported demographics):	Methods: Data from physician surveys (self-reported data) Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): PCP referral to specialist	Outcome measures: Number of referrals to specialists	Main results: Practices with nurse practitioners or physician assistants were found to have a greater likelihood of treating patients with complex conditions instead of referring them to specialists Managed care variables (size of practice, percentage of patients, percentage of revenue from prepaid contracts) affected referrals but only through the increased use of assistants or nurse practitioners	Reported associations between elements for logic model: Practice characteristics and predictors of referral

Clarke 2010[190] Country: UK Study design: Survey Data collection method: Postal return Aim: Principal aim in carrying out a nationally representative survey of GPs in England was to gather data to inform the development of new referral tools in phase 2 of the REFER project Detail of participants (number, any reported demographics): 324 GPs	Method: The REFER project was carried out to improve the process of referral from primary to secondary care for patients with non-urgent conditions who may benefit from surgical treatment Survey of GPs, surgeons and members of the public to establish the representativeness of the guideline development groups' views on referral appropriateness An eight-page self-completion questionnaire was developed based on previous research and the knowledge of the research team The questionnaire was mailed to 324 GPs who were randomly selected from the list of 10 representative PCTs in England Control: None Length of follow-up: None Response and/or attrition rate: 40% responded Context (from what/who to what/who): GP referral for elective surgery	Outcome measures: Practitioner views on referral guidelines	Main results: Although there was overall support for referral guidelines, they were rarely used in practice Over one-fifth of respondents indicated that they were expected to use referral guidelines by their local hospital or PCT. They indicated that referral guidelines would be most useful for patients with osteoarthritis of hip and knee, prostate problems, stress incontinence, infertility, back pain and menorrhagia The notion that patients should be involved in deciding whether they should be referred or not was strongly supported	Reported associations between elements for logic model: Role of patients in decision-making Lack of use of referral guidelines

Clemence 2003[228] Country: UK Study design: Qualitative Data collection method: Semistructured interviews Aim: Insight into the experiences and views of patients, GPs and physiotherapists in relation to physiotherapy referral for musculoskeletal conditions Detail of participants (number, any reported demographics): 22 semistructured in-depth interviews	Method: Interviews were undertaken with GPs in primary care, health authority and hospital locations. Interviews with physiotherapists and patients were undertaken within community and district hospital locations Control: NA Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GP referral for musculoskeletal conditions	Outcome measures: Practitioner views	Main results: Three classifications of referral type were developed by the authors from the data: 'appropriate referral', 'load-sharing referral' and 'dumping referral'. There are descriptions of influences on GP referral behaviour, physiotherapists' response to appropriateness and expectations from the perspective of GPs and physiotherapists Communication was shown as important in determining appropriate referral, but the quality of communication was variable. GPs' past experience of physiotherapy significantly affected referral. Patients' expectations about physiotherapy were described as variable and sometimes unrealistic	Reported associations between elements for logic model: The selection of appropriate referrals by GPs could be helped by improved communication and better definitions of appropriateness
Cohen 2013[267] Country: USA Study design: Cross-sectional Data collection method: Retrospective database analysis Aim: To investigate factors influencing referral Detail of participants (number, any reported demographics): Database of patients with laryngeal disorder, 149,653 patients who saw a PCP or self-referred	Methods: Database analysis Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Referral to otolaryngology	Outcome measures: Patient demographics, time to referral	Main results: Older patients more commonly had a referral Women lower hazard ratio for referral than men Greater number of PCP visits, the lower hazard ratio for referral and more days to referral Multiple comorbidities higher ratio for referral Those referred by PCP seen earlier than those self-referred	Reported associations between elements for logic model: Patient demographics and referral

Cooper and Wojnarowska 2001[279] Country: UK Study design: Cross-sectional Data collection method: Analysis of referral data Aim: To investigate influences on referral to a vulval clinic Detail of participants (number, any reported demographics): 200 patients attending a dermatology vulval clinic in two hospitals, average age 55.3 years. Majority referred by a GP (167) some other specialties	Methods: Retrospective cross-sectional analysis of referral data Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP and other specialists to dermatology vulval clinic	Outcome measures: Referrer demographics	Main results: 63% of women were referred by female doctors, despite only 38% being registered with a female GP	Reported associations between elements for logic model: Influence of physician gender on referral patterns

Cornford 2004[218] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To investigate views regarding the 2-week rule intervention for breast cancer referral Detail of participants (number, any reported demographics): 12 patients referred via the 2-week rule: six from each centre, aged 36–70 years. Two diagnosed with breast cancer 20 professionals – nine GPs, five surgeons, three nurses, one radiologist, one radiographer and one manager	Methods: Qualitative study using semistructured interviews Control: None Length of follow-up: NA Response and/or attrition rate: In centre 1 16 out of 60 (27%) patients replied to invitation and six were interviewed. Data were not available for centre 2 Context (from what/who to what/who): GP to breast specialist centres	Outcome measures: Views	Main results: None of the patients could explain the 2-week rule or define it as a new initiative. Concern was to be seen quickly and assured they did not have cancer Professionals mentioned that women referred via 2-week rule would be assured that whatever could be done would be done speedily and those without cancer could be reassured quickly All professionals described potential or actual disadvantages of the system (particularly those working in the centres). Disadvantages more strongly stated than advantages. Disadvantages – patients not referred via this category were waiting longer, or problems could result if waiting times increased. Perception that system put increased pressure on the service in terms of reorganising clinics with longer and busier clinics and more stressed staff	Reported associations between elements for logic model: Professional dissatisfaction with the model of management Loss of autonomy, potential impact on waiting time for some patients Patient pressure and increased pressure following awareness raising via media Difficulties in implementing the system

Patients emphasised importance of communication skills throughout the referral process. None thought their symptoms trivial (even after cancer had been excluded) and felt their concerns should be taken seriously	
GPs reported issues of correct diagnosis and varied in the extent to which they could accept the uncertainty about diagnosis. Increased waiting time for non-2-week categorised patients could lead to 2-week box being ticked where unsure	
Professionals in centres perceived increased pressure on GPs from patients. Patients were described as more informed, more aware of rights and having greater expectations	
Some viewed increase in breast cancer awareness as beneficial but many saw it less positively as leading to increased pressure from patients	
Some views from secondary professionals that GPs were not following the guidelines or misused the system	
Views ranged from mild irritation through sarcasm to anger. Perception of loss of control expressed by professionals. Those expressing anger at the system described loss of autonomy	

Coulston *et al.* 2008[187] Country: UK Study design: Cross-sectional Data collection method: Survey Aim: To examine referral patterns and assess knowledge of services Detail of participants (number, any reported demographics): 86 GPs in south-east Wales	Methods: Postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 86 of 120 returned (72%) Context (from what/who to what/who): GP to surgeon for groin hernia repair	Outcome measures: Referral destination	Main results: 84% referred to a general surgeon. Only 17% were aware of any specialist consultant surgeons in south Wales performing laparoscopic groin hernia repair. Of those who were aware of this service, 80% had at some time referred to this service Only 11% of GPs reported that patients ever requested referral to a hernia specialist and only 5% to a laparoscopic hernia specialist	Reported associations between elements for logic model: Link between knowledge/having information about the existence of a service and referral
Coyle 2011[280] Country: Ireland Study design: Cross-sectional Data collection method: Survey Aim: To study referral patterns Detail of participants (number, any reported demographics): 10 GPs, four GP practices, County Donegal. Data from 3166 consultations	Methods: Data collection instrument given to GPs to complete Control: None Length of follow-up: NA Response and/or attrition rate: 100% Context (from what/who to what/who): GP to secondary care including emergency and/or to AHPs in primary care team	Outcome measures: Clinical measures GP characteristics Referral made or not made	Main results: Mean referral rate of male participants to secondary care was 5.4% and for female mean referral rate 11.3% ($p < 0.0001$) Mean referral rate of single-handed practices slightly higher than group (7.9% vs. 6.3%)	Reported associations between elements for logic model: Gender difference in referral rate

Dagneaux 2012[230] Country: Belgium Study design: Qualitative Data collection method: Focus groups Aim: Focused on the relationship between GPs and hospital geriatricians Detail of participants (number, any reported demographics):	Methods: Focus group discussions were performed to describe the collaboration between GPs and hospital geriatricians: four of these focus groups contained only GPs, two groups contained only hospital geriatricians, and one group was made up of GPs and hospital specialists. Participants were invited to speak about bad or good experiences of intercollaboration Control: NA Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GPs and hospital geriatricians	Outcome measures: Practitioner views	Main results: An important regional disparity was observed: better relationships and easier collaboration were reported in those regions that benefit from a wider range of geriatric services. In areas with few geriatric services, doctors knew little of other professionals and reported suspicion and even conflicts. Positive experiences and communication favour good relationships	Reported associations between elements for logic model: Relates to links between referral and relationship between primary care and specialists The collaboration between GPs and hospital geriatricians should be enhanced: information, exchanges, and reflection on roles and competencies are essential
Dale 2000[224] Country: UK Study design: Cross-sectional Data collection method: Postal questionnaire Aim: To investigate factors influencing referral Detail of participants (number, any reported demographics): 50 GPs referring to Great Ormond Street Hospital (GOSH) from 25 health authorities in south-east England	Methods: Postal questionnaire to 50 GPs who made referrals to the GOSH Neurodisability Service Control: None Length of follow-up: NA Response and/or attrition rate: 100% Context (from what/who to what/who): GP to paediatric neurodisability service GOSH	Outcome measures: GP views	Main results: Two-thirds of GPs did not contact a specialist prior to referral 78% of GPs reported that in making the referral they were responding to parental concerns 90% gave reason for referral as parents seeking a second opinion outside their district. Other reasons for referral were having prior knowledge of the service and having previously referred to the service	Reported associations between elements for logic model: Patient influence on referral Knowledge of service

Davies 2007[256] Country: UK Study design: Mixed Data collection method: Audit of endoscopy referrals assessed how often these recorded rectal examination and whether or not patients were seen within 2 weeks. Qualitative interviews with 19 patients explored their experience of referral and diagnosis. Review of 33 case records assessed other possible delays Aim: To use clinical audit, qualitative data from patients and feedback from GPs to identify possible delays in referral, and to decrease these by implementing referral guidelines Detail of participants (number, any reported demographics): Above	Methods: Patient interviews, case record reviews Control: None Length of follow-up: None Response and/or attrition rate: 19/27 (70%) patients agreed to be interviewed Context (from what/who to what/who): GP referral for endoscopy	Outcome measures: Patient views	Main results: Most patients referred for endoscopy were seen within 2 weeks (67%, 119/177), but only 47% (71/151) of available referral letters mentioned rectal examination Patients perceived most delay in secondary care and case records suggested that this occurred after non-urgent referral. Patients also identified some problems with communication, information and support about the diagnosis Used the results to stimulate local acceptance of national referral guidelines and wider discussion about care	Reported associations between elements for logic model: Content of referral letter Patient perceptions

Dearman 2006[265] Country: UK Study design: Cross-sectional Data collection method: Analysis of patient records and referral letters + 13 referred patients matched to 13 control patients Aim: To determine which older patients are referred to psychiatric services Detail of participants (number, any reported demographics): 1089 elderly patients in one large practice in central Manchester	Methods: Retrospective analysis of computerised records and referral letters Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to psychiatry; older patients	Outcome measures: Referral rates Patient characteristics	Main results: Suicidal ideation and treatment failure were the principal reasons for referral Patients referred had a greater psychiatric comorbidity and had consulted their GP more frequently in the past year	Reported associations between elements for logic model: Patient characteristics and referral likelihood

Delva 2011 Country: France Study design: Cross-sectional Data collection method: Survey Aim: To describe factors influencing GP referral decisions for older patients with cancer Detail of participants (number, any reported demographics): GPs stratified sample – $n = 436$ 75% male, mean age 50 years, average years practice 21 years, two-thirds working in urban setting	Method: Questions on ease of referral, influencing factors plus two case vignettes Control: None Length of follow-up: NA Response and/or attrition rate: 30% Context (from what/who to what/who): GPs to oncology	Outcome measures: Factors influencing referral Demographics	Main results: Approximately half of GPs reported that they always refer elderly cancer patients More than 75% of GPs reported being influenced by patient elements (patients/ family wishes, comorbid factors, unsuitability of invasive investigations, physical and mental autonomy), cancer-related elements (severity of symptoms, side effects) and an organisational element (whether or not the GP was used to collaborating with the oncologist) Organisational difficulties in patient management and cancer site were significantly associated with less likely decision to refer in early-stage cancer (OR 0.35, 95% CI 0.24 to 0.56; $p < 0.0001$; and OR = 0.58, 95% CI 0.37 to 0.92; $p = 0.02$) GPs' attendance at training course was associated with being more likely to refer advance cancer (OR 1.85, 95% CI 1.01 to 3.38) No individual GP characteristics associated with referral decisions. GPs less likely to refer advanced cancer were those who reported being influenced by patient age, organisational difficulty in providing care and the stage of the disease	Reported associations between elements for logic model: Patient-related factors influence in referral decisions

Dodds 2004[174] Country: UK Study design: Cross-sectional Data collection method: Postal survey Aim: To investigate views regarding the 2-week wait rule Detail of participants (number, any reported demographics): 331 GPs 80% practices with four or more doctors	Methods: Cross-sectional postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 65% Context (from what/who to what/who): GP to cancer specialist	Outcome measures: Reported referral methods and views	Main results: 90% used urgent referral form, 38% wrote and additional letter. 61% referrals faxed, 27% faxed and posted 81% of GPs believed that patients with suspected cancer had an initial appointment faster than before the rule was introduced 50% of GPs thought information about the care pathway had improved following the rule, 41% no change. Main reason for improvement was GP now received fax from hospital with date of patient's initial appointment. Other comments – system less time-consuming and more efficient 3% reported missing direct contact with specialist Positive comments – simplicity of form, helpful guidelines on completion, completing form rather than dictating letter was speedier. Problems – having the right form for the right specialty, different centres used different forms, interpreting and applying the guidelines, rigid and inflexible system not offering scope for GP own judgement and experience, also importance of patient level of anxiety in decision-making. Report of some tendency to overuse 2-week referral due to patient pressure and erring on the side of caution GPs reported dislike of categorising breast cancer in suspected grade and worry wrong categorising would delay referral. Also fear that patients not referred as 2 weeks would wait too long Some suggestion that non-adoption of referral form highest among single-handed practices	Reported associations between elements for logic model: Over-referral of cases as priority in cases of uncertainty/patient pressure/patient anxiety Positive views of improved waiting time and communication Simplicity and availability of forms

Edwards 2002[257] Country: UK Study design: Qualitative Data collection method: Practice-based, semistructured group discussions Aim: To explore the responses of primary health-care professionals to guidelines in general, and to the UK national guidelines on the management and referral of women with breast conditions in particular Detail of participants (number, any reported demographics): *n* = 86 primary health-care professionals	Method: All practices were involved in a study evaluating the effect of the national breast symptom management guidelines on clinical practice. Discussion groups were conducted in the practice; 15 of the 34 study practices were audio-taped. Groups comprised the available partners and practice nurses at each practice. All members of each group were well known to one another. 1-hour educational session (approved for postgraduate education allowance), facilitated by two members of the study team (two GPs, a research psychologist and a research nurse). 15 seminars; six seminars addressed the breast lump guideline and nine addressed the breast pain guideline Control: None Length of follow-up: None Response and/or attrition rate: 75% of male partners and 90% of female partners present at the meetings. Of the practice nurses, 51% attended Context (from what/who to what/who): Primary care referral using guidelines	Outcome measures: Practitioner views	Main results: A number of areas for comment arose consistently in each discussion. Guidelines in general were welcomed, although there was more support for evidence-based than consensus-based guidelines. The breast lump guideline was also welcomed, participants commenting that it was concordant with current practice. The breast pain guideline was more contentious, participants reflecting that it recommended more primary care management than was usual, and fell outside the experience and confidence of doctors or the expectations of patients. Participants felt it did not incorporate psychosocial factors into recommended management, despite this being an important part of primary care management	Reported associations between elements for logic model: There are concerns about consensus guidelines and doubts about the applicability of the breast pain guideline in this complex management area. The failure of these guidelines to address patient anxiety may limit their implementation Different types of guideline – evidence-based vs. consensus Importance of patient psychosocial factors in referral Expectations of patients Doctor confidence

Elhayany *et al.* 2000[167] Country: Israel Study design: Cross-sectional Data collection method: Review of referral forms Aim: To examine variation in referral rates Detail of participants (number, any reported demographics): 67,577 patients seen by 44 primary care physicians in South Israel	Methods: Cross-sectional review of referral forms Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): From GP to any specialism	Outcome measures: Referral rate Characteristics of physician	Main results: Age, gender, country of origin and year of immigration to Israel of the physician were not associated with the rate of referral GPs without any postgraduate training or specialty designation were likely to refer 2.5 times more often than primary paediatricians or family physicians Being a family medicine specialist and the number of years since graduation explained 17.7% of the variability in referral rates (specialty stronger element than time since graduation). The more years since graduation, the higher the referral rate	Reported associations between elements for logic model: GP training and referral rates
Espeland 2003[217] Country: Norway Study design: Qualitative Data collection method: Focus groups Aim: To identify and describe (a) factors GPs consider may affect their decisions about ordering plain radiography for back pain and (b) barriers to guideline adherence suggested by such factors Detail of participants (number, any reported demographics): Norwegian GPs, $n = 14$	Method: Focus group interviews regarding factors affecting ordering decisions were carried out on a diverse sample of Norwegian GPs and were analysed qualitatively Results of this study and two qualitative studies from the Netherlands and USA on use of spine radiography were interpreted for barriers to guideline adherence These were compared with an existing barrier classification system Control: NA Length of follow-up: NA Response and/or attrition rate: Context (from what/who to what/who): Plain radiography for back pain	Outcome measures: Factors which predict referral	Main results: The factors that Norwegian GPs considered might affect their decisions about ordering plain radiography for back pain concerned the following broader issues: clinical ordering criteria, patients' wishes for radiography and the GP's response, uncertainty, professional dignity, access to radiology services, perception of whether the patient really was ill, sense of pressure from other health-care providers/social security, and expectations about the consequences of ordering radiography The three studies suggested several attitude-related and external barriers as classified in a previously reported system described in another study. Identified barriers not listed in this system were lack of expectancy that guideline adherence will lead to desired health-care process, emotional difficulty with adherence, improper access to actual/alternative health-care services and pressure from health-care providers/organisations	Reported associations between elements for logic model: Barriers to referral for radiography

Feeney 2007[282] Country: UK Study design: Retrospective case series Data collection method: Patient records Aim: To determine if the gender of the GP is associated with referral rates for different eating disorders Detail of participants (number, any reported demographics): 93 patients	Method: Associations between GP gender and clinical characteristics of the patients were determined using chi-squared tests and *t*-tests Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to eating disorder clinic	Outcome measures: GP gender and clinical characteristics	Main results: Referral rates by male and female GPs were similar for anorexia nervosa (28.6% vs. 71.4%) and bulimia nervosa (38.7% vs. 61.3%), each of which is similar to the referral rates by males and female GPs overall (32.3% vs. 67.7% of the sample, respectively) However, female GPs were substantially more likely to refer binge eating disorder patients (92.7% by female GPs vs. 7.7% by male GPs), but they were less likely to refer other Eating Disorder Not Otherwise Specified cases (50% referred by either gender of GP) The chi-squared test showed that there was a significant association between referrer gender and diagnosis ($\chi^2 = 6.42$, $df = 3$, $p < 0.05$). When the analysis was simplified to compare the association of a diagnosis of binge eating disorder (vs. all other diagnoses) with the gender of the referrer, this was also statistically significant ($\chi^2 = 4.17$, $df = 1$, $p < 0.025$)	Reported associations between elements for logic model: Patients with binge eating disorder were substantially more likely to be referred by female GPs, while other atypical cases were more likely to be referred by male GPs. There was no evidence that the patients referred by male GPs differed in clinical presentation from those referred by female GPs

Forrest 2003[219] Country: USA Study design: Cross-sectional Data collection method: Primary care practice-based study of referred and none referred office visits Aim: To examine the influence of gatekeeping arrangements and capitated primary care physician payment on the specialty referral process in primary care settings Detail of participants (number, any reported demographics): The study comprised 14,709 visits made by privately insured, non-elderly patients who were seen by 139 primary care physicians in 80 practices located in 31 states	Method: Visits were grouped by health plan type: gatekeeping with capitated PCP payment; gatekeeping with fee-for-service PCP payment; no gatekeeping Control: NA Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): Primary care to specialist	Outcome measures: Referral rates Dependent measures included the proportion of visits referred, characteristics of referrals, and physician co-ordination activities	Main results: The percentages of office visits resulting in a referral were similar between the two gatekeeping groups and higher than the no gatekeeping group. Patients in plans with capitated PCP payment were more likely to be referred for discretionary indications than those in non-gatekeeping plans (15.5% vs. 9.9%, $p < 0.05$). The frequency of referring physician co-ordination activities did not vary by health plan type. The proportion of patients in gatekeeping health plans within a practice was directly related to employing staff as referral co-ordinators, allowing nurses to refer without physician consultation, and permitting patients to request referrals by leaving recorded telephone messages	Reported associations between elements for logic model: In response to increasing numbers of patients enrolled in managed health plans with gatekeeping arrangements, physicians appear to modify the structure of their practices to facilitate access to and co-ordination of referrals

Forrest 2002[223] Country: USA Study design: Prospective cohort Data collection method: Survey, log of clinic visits for 15 days Aim: To examine referral decisions Detail of participants (number, any reported demographics): 141 family physicians, visits and new referrals = 34,519 + 2534 over 15 consecutive days	Method: Prospective cohort study, survey of patient data Control: None Length of follow-up: NA Response and/or attrition rate: N Context (from what/who to what/who): Primary care physicians to specialist	Outcome measures: Type of problem Number of referrals	Main results: Patient request reason for 13.6% of referrals Physicians recommended a specific practitioner to the patient for 86.2% of referrals; personal knowledge of the specialist was the most important reason for selecting a specific specialist Obtaining advice the most common reason for the referral	Reported associations between elements for logic model: Personal knowledge and referral, patient request

Forrest 2006[283] Country: USA Study design: Cross-sectional Data collection method: Survey Aim: To examine factors influencing specialty referral decision-making Detail of participants (number, any reported demographics): 142 physicians in 83 practices; 34,069 visits. Mean age of patients 42.3 years; majority female with private insurance. 43% of visits made by patients whose health plan had a gatekeeping arrangement	Method: Questionnaire completed and data collected on all patient visits during 15 consecutive working days Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Primary care physicians to specialty referral	Outcome measures: Modelling of occurrence of specialty referral	Main results: Referral made in 5.2% of visits Patient characteristics had the largest effects in any referral model. Referral decisions influenced however by a complex mix of patient, physician and health-care system structural characteristics including primary care physician with less tolerance of uncertainty, larger practice, gatekeeping health plan, level of managed care Variables not influential: physician gender, anxiety due to clinical uncertainty, anxiety regarding bad outcomes, perceived clinical expertise, specialist availability, perceived pressure to control referral costs, restricted ability to obtain invasive tests, restricted ability to obtain surgical referrals, Herfindahl Index, hours of patient care per week, visits per day, type of physician income, ownership of the practice Patient variable increased the chance of referral were aged over 17 years, male, uncommon presenting problem cared for by GP, high burden of comorbidity, patient insured, health plan had gatekeeping arrangements Physician variables associated with referral were greater reluctance to disclose uncertainty to patients, less reluctance to disclose uncertainty to other physicians Practice characteristics associated with referral were higher levels of managed care in the practice and larger group practices	Reported associations between elements for logic model: Patient, physician and service characteristics and likelihood of referral

Forrest 2007[246] Country: USA Study design: Survey Data collection method: Self-administered questionnaire Aim: Describes referral completion from the perspectives of patients and primary-care physicians and identifies predictors of adherence to the referral recommendation Detail of participants (number, any reported demographics): Cohort of 776 referred patients from the offices of 133 physicians in 81 practices and 30 states	Method: Referring physicians and patients completed self-administered questionnaires at the time of the referral decision and 3 months later Length of follow-up: 3 months Response and/or attrition rate: 78% patient response rate, 97% physician response rate Context (from what/who to what/who): Primary care to specialist	Outcome measures: Practitioner views Patient views	Main results: Physicians reported that 79.2% of patients referred had a specialist visit, and 83.0% of patients indicated they completed the referral The most common reasons for not completing the referral were 'lack of time' and patient belief that the 'health problem had resolved' The κ-statistic for patient–physician agreement on referral completion was 0.34, indicating only fair concordance. Patients in Medicaid plans were less likely than others to complete the referral, and more likely to experience a health plan denial. A longer duration of the patient relationship with the primary care physician and physician/staff scheduling of the specialty appointment were both positive predictors of referral completion	Reported associations between elements for logic model: Referral completion rates may be increased by assisting patients with scheduling their specialty appointments and promoting continuity of care Relationship between doctor–patient relationship and attendance
Franks 2000[216] Country: USA Study design: Cross-sectional Data collection method: Physician survey and patient database analysis Aim: To determine which factors contribute to variation in referral rates Detail of participants (number, any reported demographics): 173 internists and family physicians in Rochester, NY area	Methods: Claims database used for patient data, survey to physicians included several psychometric scales using Likert scales Control: None Length of follow-up: NA Response and/or attrition rate: 66% Context (from what/who to what/who): Primary care to specialty referral	Outcome measures: Patient referral rate Predicted risk of referral measure Physician demographics/ characteristics	Main results: Patients more likely to be referred if physician female, had more years in practice, was an internist and used a narrower range of diagnoses Greater psychosocial orientation and greater malpractice fear associated with greater likelihood of referral. Other psychological measures explained little of the variance in referral When physician factors excluded from the analysis risk aversion positively associated with referral likelihood	Reported associations between elements for logic model: Physician psychological factors little associated with referral Demographic factors associated with referral

Franz 2010[307] Country: USA Study design: Qualitative Data collection method: interviews Aim: To describe structural barriers to mental health specialists and consequences of these barriers to care for patients with dementia and neuropsychological symptoms and their primary care physicians Detail of participants (number, any reported demographics): 40 primary care physicians in California	Methods: Open-ended interviews lasting 30–60 minutes Length of follow-up: None Response and/or attrition rate: NR Context (from what/who to what/who): primary care to mental health	Outcome measures: Practitioner views	Main results: 93% of the primary care physicians described problematic access and communication with mental health services (in particular psychiatrists and neuropsychiatrists) as impediments to effective care for dementia patients Thematic analysis identified structural barriers to mental health referrals ranging from problems with managed care and reimbursement policies to lack of trained providers and poor geographical distribution of specialists. Structural barriers compromised care for patients with dementia because the barriers limited PCP treatment options and resources, impacted office staff and time with other patients, impeded and delayed care, and fostered poor communication and lack of co-ordinated care Negative consequences for PCPs included increased frustration, conflict and burnout	Reported associations between elements for logic model: Structural barriers to mental health referrals ranging from problems with managed care and reimbursement policies to lack of trained providers and poor geographical distribution of specialists
Freed *et al.* 2003[172] Country: USA Study design: Cross-sectional Data collection method: Postal survey Aim: To examine the referral preferences of physicians Detail of participants (number, any reported demographics):	Methods: Cross-sectional postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 49% for family physicians Context (from what/who to what/who): Primary-care provider referral for juvenile rheumatoid arthritis	Outcome measures: Reported factors	Main results: 61% of family physicians referred only to confirm the diagnosis and guide initial therapy The majority of family physicians reported feeling more confident managing the disease in adults rather than children (82%). Few respondents felt that they were up to date on the latest advances in juvenile rheumatoid arthritis treatment	Reported associations between elements for logic model: Physician beliefs regarding adequacy of knowledge

Fucito 2003[162] Country: Australia Study design: Cross-sectional Data collection method: Survey Aim: To determine the current practices of established GPs in managing patients with drug- and alcohol-related problems and identify gaps in training Detail of participants (number, any reported demographics): 145 GPs, 51% males and 49% females had an average age of 46.5 + 11.6 years and had worked in general practice for an average of 17.5 + 10.2 years	Method: A random sample of GPs completed a survey assessing diagnostic skills and referral practices concerning alcohol and illicit drug use in general practices in February 1999, comprising 110 GPs registered with the Central Sydney Division of General Practice Control: NA Length of follow-up: NA Response and/or attrition rate: 110 (75.9%) Context (from what/who to what/who): GP referral for drugs/alcohol problems	Outcome measures: Competent skills and knowledge, willingness to treat	Main results: The majority (96%) of GPs provided clinically appropriate responses for at least one drug category, although none received this rating for all six Most GPs reported that they were unwilling to treat heroin and cocaine problems themselves but expressed willingness to refer patients appropriately GPs who stated they regularly obtained information about drug and alcohol use were more likely to refer patients ($\chi^2 = 7.0$, $p < 0.01$) More than one-quarter of GPs were unaware of the safe drinking levels for men and women or the appropriate treatment for patients consuming above such levels Age, years in practice, type of practice, willingness to obtain drug-use histories and post-graduate training were all significantly associated with GPs' willingness to treat and competence in managing drug- and alcohol-related problems In this study, GPs reported low levels of skills and referrals for treatment of illicit drug use and suboptimal skills in the management of alcohol problems	Reported associations between elements for logic model: The results suggest that a more comprehensive approach to education and training is required to bring about a change in practice behaviour

Gandhi 2000[101] Country: USA Study design: Cross-sectional Data collection method: postal survey Aim: To examine dissatisfaction in the referral process Detail of participants (number, any reported demographics): 48 primary care providers and 'over 400' specialists	Methods: Cross-sectional postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 56% PCPs and 53% specialists Context (from what/who to what/who): Primary care provider to orthopaedics, cardiology and gastroenterology	Outcome measures: Scale of satisfaction	Main results: Primary care providers – three biggest problems with referral system were lack of timeliness of information from specialists, redundancy of the current process, and time required to create adequate referral notes Specialists – lack of timeliness of information from primary care providers, time required for medical management and lack of clarity of note content from primary care providers 28% of GPs and 11% of specialists somewhat or very satisfied with information provided. 28% of primary care providers and 43% of specialists dissatisfied with information received from the other group Specialists reported not receiving adequate information to address the problem 23% of the time	Reported associations between elements for logic model: Content of information exchange

Glozier 2007[254] Country: UK Study design: Cohort study Data collection method: Analysis of consecutive referral data, patient interview/questionnaires Aim: To assess the impact of patient distress and beliefs on GP urgent referral requests Detail of participants (number, any reported demographics): 188 referrals	Methods: Patients interviewed and completed questionnaires regarding impairment, distress, personality and illness beliefs Control: None Length of follow-up: NA Response and/or attrition rate: 188/208 potential participants were included (90%) Context (from what/who to what/who): GP to orthopaedic department	Outcome measures: Psychological distress (GHQ) Patient perceptions of symptom control (Illness Perception Questionnaire – subscales regarding personal control of symptoms, treatment effectiveness in symptom control, likely consequences) Patient characteristics	Main results: 12% or referrals urgent and 88% routine Clinical measures associated with GP urgent request were pain, joint impairment, and disability reported by patient No sociodemographic characteristics were associated with an urgent request (patient gender, occupational class, marital status, support network, ethnicity, employment) Psychological distress of patient not associated with urgent referral (OR 1.62, 95% CI 0.64 to 4.07). Distressed in fact two times less likely to be referred urgently (OR 0.39, 95% CI 0.11 to 1.36) Adjusting for pain or disability eightfold difference in likelihood of urgent referral between those with least perceived control and most. OR of an urgent referral were 2.18 (95% CI 1.18 to 4.05) for each increasing quartile of personal symptom control Greater personal control and disability accounted for 46% of variance. No significant association age, number of comorbid conditions, number of medications, impairment, neuroticism and likelihood of urgent referral	Reported associations between elements for logic model: Appropriate referrals linked to patient disability Patient personal control and referral – assertive patients better able to influence and control their lives more successful at obtaining an urgent referral?

Grace 2008[292] Country: Canada Study design: Cross-sectional Data collection method: Survey Aim: To compare factors affecting cardiac rehab referral in primary care physicians versus cardiac specialists Detail of participants (number, any reported demographics): 510 primary care physicians and cardiac specialists	Method: A cross-sectional survey of a stratified random sample of 510 primary care physicians and cardiac specialists (cardiologists or cardiovascular surgeons) in Ontario identified through the Canadian Medical Directory Online was administered. One hundred four primary care physicians and 81 cardiac specialists responded to the 26-item investigator-generated survey Control: NA Length of follow-up: NA Response and/or attrition rate: One hundred and four primary care physicians and 81 cardiac specialists (i.e. 185/510 or 36% response rate) Context (from what/who to what/who): GP to cardiac rehab	Outcome measures: Medical, demographic, attitudinal and health system factors affecting CR referral	Main results: Primary care physicians were more likely to endorse lack of familiarity with cardiac rehab site locations ($p < 0.001$), lack of standardised referral forms ($p < 0.001$), inconvenience ($p = 0.04$), programme quality ($p = 0.004$) and lack of discharge communication from cadiac rehab ($p < 0.001$) as factors negatively impacting cardiac rehab referral practices than cardiac specialists Cardiac specialists were significantly more likely to perceive that their colleagues and department would regularly refer patients to cardiac rehab than primary care physicians ($p < 0.001$)	Reported associations between elements for logic model: Unclear

Green 2008[220] Country: UK Study design: Cross-sectional Data collection method: Postal questionnaire and patient vignette Aim: To examine GP individual differences in intention to refer Detail of participants (number, any reported demographics): Three PCTs, 88 GPs; 55% female, practised for a mean of 15 years, half in urban/suburban practices and half rural. Two-thirds had specialist psychiatric experience	Method: Questionnaire developed from the theory of planned behaviour to assess attitudes, perceived norms, behavioural control and intention to refer. Responses on Likert scale. Vignette of hypothetical patient presenting for travel immunisation – in half of vignettes patient had normal weight and half underweight Control: Compared vignette of patient with normal weight with that of one underweight Length of follow-up: NA Response and/or attrition rate: 33% Context (from what/who to what/who): GP to specialist eating disorder service	Outcome measures: Referral intent	Main results: None of the GP or practice characteristics had a significant impact on GPs intention to refer ($p = 0.05$) Weight of patient did not impact on decision to refer None of the GPs beliefs, feeling of control over referral or whether or not felt had necessary referral skills were predictors of intention to refer ($r = -0.05$, $p = 0.678$ and $r = -0.03$ and $p = 0.806$) Cognitive attitudes were on the positive side towards referral (referral would be sensible/appropriate/helpful) 57%/55%/55% agreement Intention to refer was significantly related to subjective norms (referral would be recommended by colleagues/guidelines/research evidence) and cognitive attitudes ($r = 0.917$ and 0.0896 $p < 0.001$); together these predictors explained 86% of the variance in intention to refer	Reported associations between elements for logic model: Variance in referral behaviour may be explained by cognitive attitudes and subjective norms – belief that their behaviour is in line with colleagues and guidelines when in reality it varies

Greenaway 2006[306] Country: UK Study design: Mixed method Data collection method: Postal questionnaire with free-text responses Aim: To explore GP views of onsite vs. offsite psychology services Detail of participants (number, any reported demographics): 60 GP participants' practices that refer to offsite psychology services and 60 participants practices with on-site psychology services	Methods: Quantitative data and free-text comment responses Control: None Length of follow-up: NA Response and/or attrition rate: 209 questionnaires sent, 120 returned (57%) Context (from what/who to what/who): GP referral to psychology	Outcome measures: Perceptions of service, perceptions of referral process	Main results: No significant difference in understanding of psychological therapies between those with on-site and those with off-site services. On-site group rated own understanding of different providers of psychological services as higher ($p = 0.003$) 36% of GPs in off-site group indicated they had been provided with information on making referrals to their local psychology service, compared with 73.2% in the on-site group ($p < 0.001$) Free-text data indicated more positive perceptions of on-site service Having an on-site psychology service did not significantly affect GP perceived referral rate to psychology ($p > 0.05$)	Reported associations between elements for logic model: On-site services associated in GP greater knowledge of specialist service and more positive perceptions; however, they did not change perceived referral rate
Greer 2011[240] Country: USA Study design: Cross-sectional Data collection method: Survey Aim: To assess whether or not primary care provider use of a kidney function test impacted on timing of referral Detail of participants (number, any reported demographics): 178 family physicians plus internists and nephrologists. Primary care providers' median years of practice 12 (3–21) majority in non-academic settings	Method: Participants sent one of four hypothetical case scenarios featuring a white or African American female patient with or without diabetes with progressing chronic kidney disease. Test results provided for EGFR and serum creatinine. Participants asked to identify the test results at which they would refer. Visual analogue scales Control: None Length of follow-up: NA Response and/or attrition rate: Of the 959 physicians in active clinical practice, a total of 126 nephrologists and 178 primary care physicians responded to the questionnaire, i.e. 32% Context (from what/who to what/who): PCP to kidney specialist	Outcome measures: Demographics Timing of referral	Main results: One-third of PCPs reported aware of subspecialty referral guidelines for chronic kidney disease PCPs recommended referral earlier when using eGFR test results than when using serum creatinine to estimate kidney function. 94% recommended referral using eGFR, compared with 55% using serum creatinine results. 40% of PCPs significantly improved the timing of their referral using results from the EGFR test The improvement in timing of referrals was greater for physicians presented with a hypothetical white patient than African American	Reported associations between elements for logic model: Enhanced use of the optimal test by PCPs could be associated with more timely referral

Gross 2000[261] Country: Israel Study design: Cross-sectional Data collection method: Telephone survey Aim: To examine perceptions of patients regarding gatekeeping vs. self-referral models Detail of participants (number, any reported demographics): 1084 patients	Method: National telephone survey Control: NA Length of follow-up: NA Response and/or attrition rate: 81% Context (from what/who to what/who): Primary to specialist	Outcome measures: Views	Main results: One-third of respondents preferred self-referral to a specialist. 40% prefer their family physician to act as a gatekeeper. 19% preferred the physician to co-ordinate care but to refer themselves to a specialist Variables associated with preferring gatekeeping model were not living in the central area of the country, having sick fund membership, low level of education, being male, fair or poor health status, having a permanent family physician, and being satisfied with the professional level of the family physician. Association between self-referral and practising self-referral	Reported associations between elements for logic model: Variance in patient attitudes towards physicians as gatekeepers
Gruen 2002[281] Country: Australia Study design: Cross-sectional Data collection method: Survey of patient encounters Aim: To explore a link between geographical proximity and referral Detail of participants (number, any reported demographics): 3030 GPs, each reporting 100 patient encounters	Method: Part of BEACH programme describing GP activity Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to surgical specialist, (general, vascular, plastic, orthopaedic, ENT, obstetrics and gynaecology, ophthalmology, urology and other)	Outcome measures: Referral to surgical specialist Presence or absence of local specialist (located in same population centre)	Main results: Absence of local specialist did not influence proportion of general surgical referrals Absence of local specialist associated with significantly lower rate for obstetric referrals and opthalmological problems (OR 0.56, 95% CI 0.44 to 0.70 and OR 0.60, 95% CI 0.49 to 0.73). Greater likelihood of referring orthopaedic problems, though Other factors influencing lower referral rate: male GP, female or younger patient, holder of health-care card, injury-related and non-cancer problem, follow-up presentation, more than one problem managed at a consultation	Reported associations between elements for logic model: Some link local service and referral but only some specialties

Guevara 2009[290] Country: USA Study design: Cross-sectional Data collection method: Postal survey Aim: To determine whether or not on-site mental health provision is associated with referral Detail of participants (number, any reported demographics): 56% male; 59% under 46 years; 52% suburban locations. 17% had on-site services. Number of participants not provided in region of 300	Method: Physician Belief Scale, demographics Control: None Length of follow-up: NA Response and/or attrition rate: 51% Context (from what/who to what/who): Primary-care paediatricians to mental health	Outcome measures: Likelihood of consultation or referral	Main results: Paediatricians with on-site mental health provision were more likely than those without to consult (OR 6.58, 95% CI 3.55 to 12.18) or to refer (OR 4.25, 95% CI 2.19 to 8.22) Those with greater burden less likely to refer than those with lesser burden Physician beliefs concerning mental health treatment were not associated with consultation or referral	Reported associations between elements for logic model: Colocation of services and increased referral

Harlan 2009[231] Country: USA Study design: Cross-sectional Data collection method: Questionnaire Aim: To perform a needs assessment by exploring important issues around communication between paediatric hospitalists and primary care providers Detail of participants (number, any reported demographics): 10 paediatric hospitalists and 12 paediatric primary care providers	Method: Six previously identified issues around hospitalist–primary care provider communication from the adult hospitalist literature were abstracted and incorporated into an open-ended and closed-ended questionnaire. The questionnaire was pretested, revised, and administered by telephone to 10 paediatric hospitalists and 12 paediatric primary care providers Control: NA Length of follow-up: NA Response and/or attrition rate: No primary care provider who was able to be contacted declined an interview Context (from what/who to what/who): Paediatric hospitalists and primary care providers	Outcome measures: Practitioner views	Main results: The six identified issues were quality of communication, barriers to communication, methods of information sharing, key data element requirements, critical timing and perceived benefits Hospitalists and primary care providers rated overall quality of communication from ‘poor’ to ‘very good’ Both groups acknowledge that significant barriers to optimal communication currently exist and yet the barriers differ for each group. Hospitalists and primary care providers agree on what information is important to transmit (diagnoses, medications, follow-up needs and pending laboratory test results) and critical times for communication during the hospitalisation (at discharge, admission and during major clinical changes) Both groups also agree that optimal communication could improve many aspects of patient care	Reported associations between elements for logic model: Unclear

Harris 2011[268] Country: Australia Study design: Part of a quasi-experimental study Data collection method: Questionnaires Aim: Explored the patient and practice factors associated with referral of patients with diabetes, ischaemic heart disease or hypertension to external allied health providers Detail of participants (number, any reported demographics): 26 practices. The mean age of patients was 61.6 years, ranging from 19 to 90 years; females (55%)	Method: A multilevel analysis of data collected as part of a quasi-experimental study was conducted in 26 practices in Sydney. The frequency of patient-reported referral to AHPs 6 months post intervention was measured against patient and practice characteristics assessed by patients and practice staff questionnaires Control: None Length of follow-up: None Response and/or attrition rate: Not reported Context (from what/who to what/who): Ischaemic heart disease or hypertension	Outcome measures: The frequency of patient-reported referral	Main results: Seven per cent of the total variance in the referrals was due to differences between practices and 93% attributed to differences between patients. Previous referral, age over 45 years, multiple conditions, longer illness duration, poor mental and physical health were associated with the likelihood of referral to allied health providers, but not socioeconomic status, patient self-assessment of care and the intervention. Those attending practices with over three GPs were more likely to be referred After adjustment for other covariates, the likelihood of referrals was greater for 'patients age 60 and over' (OR for 60–70 years 3.00, 95% CI 1.08 to 8.34; and OR for over 70 years 3.37, 95% CI 1.01 to 11.17). The reference group was those aged 19–45 years; patients with longer duration (4–10 years) of disease (OR 3.89, 95% CI 1.29 to 11.71) compared with 1–3 years of duration; patients with lower mental component score SF12 (OR 0.97, 95% CI 0.94 to 0.99) and lower physical component score SF12 (OR 0.97; 95% CI 0.94 to 1.00); and the likelihood of referrals was less for: patients with only hypertension or ischaemic heart disease, i.e. one condition only (OR 0.18, 95% CI 0.07 to 0.45)	Reported associations between elements for logic model: Unclear

Harvey *et al.* 2005[242] Country: UK Study design: Cross-sectional Data collection method: Postal questionnaire Aim: To examine preferences for referral to mental health services Detail of participants (number, any reported demographics): 107 GPs Sheffield	Methods: Two questionnaires sent one year apart (no intervention in between). Use of case vignettes Control: None Length of follow-up: NA Response and/or attrition rate: 94% Context (from what/who to what/who): GP referral to psychiatry	Outcome measures: GP demographics Clinical care	Main results: GPs producing higher-quality referral letters had graduated more recently No difference, however, between those writing higher-quality referral letters and the number of proposed referrals to psychiatric services and those writing lower-quality letters and the number of proposed referrals	Reported associations between elements for logic model: Recently trained GPs and referral practices No link between quality of practitioner referral letter and their proposed number of referrals
Holley 2010[293] Country: USA Study design: Qualitative Data collection method: Focus groups Aim: To understand the barriers facing primary care providers, including nurse practitioners and physician assistants, in the current referral-to-eye-care process and to solicit suggestions from primary care providers on how to improve the current referral system Detail of participants (number, any reported demographics): 17 primary care providers	Methods: Four focus groups were conducted with a total of 17 primary care providers – two groups with physicians (one in a rural setting and one in an academic medical centre setting) and one group of nurse practitioners and one of physican assistants, both in an academic setting Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to eye care providers	Outcome measures: Provider views	Main results: The most frequently cited referral barriers included (1) poor communication from eye care providers, (2) patients' lack of finances/ insurance coverage and (3) difficulty in scheduling an eye care appointment Suggestions made in all groups on ways to improve the current referral system included (1) implementing EMRs, (2) receiving better communication/feedback from ECPs, (3) having ophthalmologists hold clinic days in primary care facilities and (4) performing retinal scans in primary care clinics We found few differences between the opinions of physicians and those of nurse practitioners and physician assistants	Reported associations between elements for logic model: Better communication between primary care providers and eye care providers, further implementation of EMRs, and increasing eye screening in primary care clinics were common themes Role of feedback following consultation in GP satisfaction with service

Hugo *et al.* 2000[272] Country: UK Study design: Cross-sectional Data collection method: Referral data and practitioner data Aim: To explore referral rates and practitioner characteristics Detail of participants (number, any reported demographics): 434 GPs, 137 practices, 34% single-handed, largest had nine partners. 39% fundholding	Methods: Database of referrals and details obtained from medical directories and health authority data used Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to eating-disorder clinic	Outcome measures: GP demographics Practice characteristics	Main results: Wide variation in referral rates All factors examined were significantly associated with higher referral rates Highest rate associated with proximity to clinic, female GPs, GPs having the MRCGP qualification, being UK qualified and offering full contraceptive services. Fundholding associated with lower rate of referral	Reported associations between elements for logic model: Practitioner and practice characteristics associated with referral rates
Hyman 2001[248] Country: Canada Study design: Cross-sectional Data collection method: Survey Aim: To examine physician characteristics associated with referral Detail of participants (number, any reported demographics): 64 family physicians serving the Caribbean community of Toronto; 40% female; age range 29–71 years (mean 42.16 years); 55.6% born in Canada	Methods: Postal survey, scale for likelihood of referral relating to practice and patient factors Control: None Length of follow-up: NA Response and/or attrition rate: Context (from what/who to what/who): GP referral for mammography for Caribbean patients	Outcome measures: Likelihood of referral	Main results: The only variable that was significantly associated with likelihood of referral was that physicians who spent more time on patient education were more likely to refer Factors not associated with likelihood of referral: number of patients seen per week, number of regular patients, gender of physician Significant gender differences with regard to perceived barriers to referral. For male physicians intervention causes patient discomfort; patient refusals were significantly barriers to referral	Reported associations between elements for logic model: Physician factors and predictors

Jiwa *et al.* 2008[193] Country: UK and Australia Study design: Cross-sectional Data collection method: Postal survey including vignettes Aim: To understand how practitioners determine which patients warrant referral Detail of participants (number, any reported demographics): $n = 260$; equal gender distribution; majority older than 40 years; most in practice longer than 5 years	Method: Vignettes of patients with colorectal symptoms, six clinical details with two possible variations; therefore, 64 possible combinations. Each respondent presented with nine vignettes. Based on features of colorectal cancer as in national guidelines. 64 vignettes high-risk cancer patients, others not Control: None Length of follow-up: NA Response and/or attrition rate: 52% Context (from what/who to what/who): GP to specialist for lower bowel symptoms	Outcome measures: Demographics Decision to refer patient on appropriate pathway (urgent or routine)	Main results: Appropriate referral pathway selected correctly for 56.2% of cases. Of those with high-risk symptoms 58% were referred urgently 31.3% of the variability within the urgent referral decisions was explained by clinical characteristics (age of patient, gender, rectal bleeding, change in bowel habit, anaemia, weight loss), the age of the GP and location of the practice Having weight loss as a symptom was influential on referral decision (this may be when disease is at a later stage and is not a helpful basis on which to refer patients)	Reported associations between elements for logic model: Application of guidelines is moderate or negated by influence of characteristics of patients
Jiwa *et al.* 2009[241] Country: UK Study design: Cross-sectional Data collection method: Analysis of referral letters Aim: To assess whether or not the quality of a referral letter is important in a patient's journey Detail of participants (number, any reported demographics): 207 consecutive letters to gastroenterologists. Patients diagnosed with histological lesions and no histological lesion, patients who had a diagnosis unknown, patients who failed to attend	Methods: Quality score given to each letter based on informational content Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Gastroenterologists	Outcome measures: Clinical categories Ability to triage from the letter	Main results: The cases that could be triaged from the letter were those where the letter contained more information (mean 66.38 vs. 49.86, mean difference 16.95%, 95% CI 1.3 to 31.7; $p < 0.001$). More information was helpful when deciding which patients to triage first	Reported associations between elements for logic model: Referral letter content and triaging

Johnson 2011[245] Country: Australia Study design: Cross-sectional Data collection method: Postal survey Aim: To examine factors influencing referral to specialist palliative care Detail of participants (number, any reported demographics): 469 GP; details reported as compared with national average rather than giving details of sample	Methods: Self-report survey mailed to a stratified random sample of 1680 Australian GPs Control: None Length of follow-up: NA Response and/or attrition rate: 31% Context (from what/who to what/who): GP to palliative care	Outcome measures: Referral rate GP characteristics Patient characteristics	Main results: Six predictors of higher referral – Practice location (New South Wales vs. other states $p = 0.010$) Agree primary care provider or primary care inpatient consultative service available ($p = 0.001$) Agree needs of family better met ($p = 0.018$) Very satisfied level of satisfaction with service ($p < 0.001$) Reasons for not referring – only absence of symptoms significant ($p = 0.025$)	Reported associations between elements for logic model: Predictors of referral primarily disease related rather than for psychological and emotional concerns

Johnson 2011[289] Country: Australia Study design: Qualitative Data collection method: Semistructured interviews Aim: To describe doctors' perceptions of barriers to referring patients for specialist palliative care, and to identify triggers and facilitators for referral Detail of participants (number, any reported demographics): $n = 40$, age mean 47 years (range 30–60 years)	Method: Forty semistructured telephone interviews were conducted with doctors involved in the care of people with advanced cancer from a variety of settings Control: NA Length of follow-up: NA Response and/or attrition rate: 40% response rate Context (from what/who to what/who): Oncology	Outcome measures: Practitioner views	Main results: Six themes were identified: disease and treatment; psychosocial; communication and interpersonal issues; health services issues; timing; and health professionals' skills. All doctors considered the presence and complexity of physical symptoms, stage of the disease and treatment orientation as important in decisions to refer for specialist palliative care. Less important were the psychosocial well-being and cultural characteristics of the person with cancer and their family. Factors reportedly affecting referral and access included health professionals' ability to communicate openly and honestly about disease progression, availability and location of specialist palliative care resources and doctors' expertise. Divergent views were expressed about appropriate timing for access. The predominant view that specialist palliative care is for management of physical symptoms may result in non-referral of those who have complex problems without physical symptoms	Reported associations between elements for logic model: Patient/disease characteristics and referral Less important psychosocial factors Doctor–patient relationship and referral Doctor's expertise Availability of resources

Johnson *et al.* 2008[271] Country: USA Study design: Cross-sectional Data collection method: Postal survey Aim: To examine physician knowledge and attitude towards audiology referral for elderly patients Detail of participants (number, any reported demographics): 95 surveys completed; 53.2% male; internists (72%), family physicians (16.7%), private practice (47.8%); 51% in practice for more than 15 years	Methods: Cross-sectional postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 13.7% Context (from what/who to what/who): Primary care providers to audiology/ otolaryngology	Outcome measures: GP knowledge	Main results: Primary care providers were generally not conducting screening for hearing or balance, were not aware of patients self-report questionnaires or likely to screen in the future Referral to audiologist/otolaryngologists mainly when patients complained of having hearing or balance difficulties Participants reported that these problems were important but that they had little time and were not reimbursed for screening	Reported associations between elements for logic model: Primary care providers' knowledge/use of screening tools Patient request for referral
Jorgensen 2001[181] Country: Denmark Study design: Cross-sectional Data collection method: Referral rate data and survey Aim: To describe referral rates and investigate possible predictors Detail of participants (number, any reported demographics): 38,231 referrals from 260 practices examined. 410 GPs, 30% in single-handed practices	Methods: Mixed methods – analysis of health insurance data, and also questionnaire Control: None Length of follow-up: NA Response and/or attrition rate: 90% returned survey Context (from what/who to what/who): GP to physiotherapy	Outcome measures: Referral rate GP demographics Patient demographics	Main results: Referral rates varied 1.6% to 13.2% between practices Twice as many women as men referred Referral rates increase with patient age group up to 35 years and remain stable over this age Practice location, female GP practice and GPs having frequent contact with physiotherapist explained small variation in referral rates (6.7% to 9.2%), leaving the greatest majority of variation unexplained	Reported associations between elements for logic model: Lack of explanation of demographic factors in referral rate differences

Kasje 2004[191] Country: the Netherlands Study design: Cross-sectional Data collection method: Structured survey Aim: To compare the willingness of hospital specialists and GPs to use joint treatment guidelines, and to determine the most relevant barriers and facilitators Detail of participants (number, any reported demographics): One hundred and ninety-seven GPs and 34 general internists and cardiologists from the north of the Netherlands	Method: Structured survey with GPs, general internists and cardiologists Control: None Length of follow-up: None Response and/or attrition rate: More than half of all cardiologists (16 out of 24) and internists (18 out of 36), and three-quarters of all GPs (197 out of 261) in the region completed the general part of the questionnaire Context (from what/who to what/who): GP/specialist referral using guidelines	Outcome measures: Practitioner views	Main results: Most hospital specialists relied for their prescribing on international guidelines and agreements within their own department, whereas GPs relied more on national and regional guidelines GPs were more supportive than specialists of the initiative to develop joint treatment guidelines, although both groups had concerns regarding the development process An important barrier for specialists was that they did not perceive a need for these guidelines. As enabling factors, physicians stated that these joint guidelines can lead to harmonisation between specialists and GPs, and that they can be useful as an educational tool	Reported associations between elements for logic model: Specialists are less ready to adopt joint treatment guidelines than GPs, indicating the need for a different approach to implement such guidelines in the two sectors Different use of guidelines GP and specialist
Kier 2012[294] Country: UK Study design: Cross-sectional Data collection method: Survey Aim: To investigate the use and compliance with guidelines Detail of participants (number, any reported demographics): Two-thirds of respondents male; 79% over 40 years; 62% had less than 20 years in practice	Methods: Survey Control: None Length of follow-up: NA Response and/or attrition rate: 50% Context (from what/who to what/who): GP to spinal manipulative therapy (SMT)	Outcome measures: Demographics Referral	Main results: 72% had referred patients for SMT; a further 13% would consider referring 21% who had never referred patients neither had nor would consider it Study concludes that GPs comply with guidelines on back pain and SMT as a care option, with a minor group that do not comply	Reported associations between elements for logic model: Compliance with guidelines

Kim 2009[98] Country: USA Study design: Survey Data collection method: Web-based Aim: To survey primary care providers to assess the impact of electronic referrals on workflow and clinical care Detail of participants (number, any reported demographics): $n = 298$	Method: 18-item, web-based questionnaire to all 368 primary care providers who had the option of referring to San Francisco General Hospital Asked participants to rate time spent submitting a referral, guidance of work-up, wait times and change in overall clinical care compared with prior referral methods using five-point Likert scales Length of follow-up: None Response and/or attrition rate: Two hundred and ninety-eight primary care providers (81.0%) from 24 clinics participated Context (from what/who to what/who): Primary care to clinical care	Outcome measures: Practitioner views	Main results: Over half (55.4%) worked at hospital-based clinics, 27.9% at county-funded community clinics and 17.1% at non-county-funded community clinics. Most (71.9%) reported that electronic referrals had improved overall clinical care. Providers from non-county-funded clinics (AOR 0.40, 95% CI 0.14 to 0.79) and those who spent ≥ 6 minutes submitting an electronic referral (AOR 0.33, 95% CI 0.18 to 0.61) were significantly less likely than other participants to report that electronic referrals had improved clinical care	Reported associations between elements for logic model: Primary care providers felt electronic referrals improved health-care access and quality; those who reported a negative impact on workflow were less likely to agree

Kinchen 2004[238] Country: USA Study design: Cross-sectional Data collection method: Survey Aim: To determine the importance of factors in primary care physicians' choice of specialist when referring patients and to compare importance ratings by physicians' race and sex Detail of participants (number, any reported demographics): 1252 primary care physicians	Method: Surveyed a stratified national sample of 1252 primary care physicians serving adults to include equal numbers of black women, white women, black men and white men. Assessed the percentage of physicians rating each of 17 items to be of major importance in choosing a specialist and compared importance ratings by physicians' race and sex Control: NA Length of follow-up: NA Response and/or attrition rate: The response rate was 59.1% Context (from what/who to what/who): GP to specialist	Outcome measures: Referral	Main results: Medical skill, appointment timeliness, insurance coverage, previous experience with the specialist, quality of specialist communication, specialist efforts to return patient to primary physician for care and the likelihood of good patient–specialist rapport were of major importance to most respondents Compared with black physicians, white physicians were more likely to rate previous experience with the specialist (65% vs. 55%, $p = 0.05$) and board certification (41% vs. 29%, $p < 0.05$) to be of major importance White physicians were somewhat less likely than black physicians (17% vs. 26%, $p = 0.06$) to rate patient convenience to be of major importance Compared with male physicians, female physicians were more likely to rate the patient's insurance status to be of major importance (60% vs. 44%, $p < 0.01$)	Reported associations between elements for logic model: The importance of patient convenience, previous experience with the specialist, specialist board certification and insurance coverage accepted by specialist varied by physicians' race and sex

Kisely 2002[185] Country: Australia Study design: Cross-sectional Data collection method: Questionnaire and interviews Aim: To evaluate a primary care partnership with mental health including understanding to streamline referrals, a consultation-liaison service and a Balint group (not described) Detail of participants (number, any reported demographics): 74 GPs	Methods: 34 (45%) of GPs returned questionnaires and 46 (62%) participated in interviews Balint group membership provides a space to think about those encounters which leave professionals drained, puzzled or stuck, and through discussion about the relationship, the possibility of finding new ways forward with the patient (see http://balint.co.uk/) Control: NA Length of follow-up: NA Response and/or attrition rate: 45% Context (from what/who to what/who): GP referral to mental health services	Outcome measures: Practitioner views	Main results: 26 (80%) found the duty officer useful as a point of first contact liaison contact 19 (60%) used referral forms Most (80%) were aware of the consultation-liaison service and had either used it or been in the Balint group	Reported associations between elements for logic model: Use of referral forms only 60%

Knight 2003[177] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To identify factors considered by GPs in making referral decisions Detail of participants (number, any reported demographics): Nine GPs from two surgeries in Northamptonshire – eight male, one female	Methods: Qualitative interviews Rating scale also used within the interviews relating to service and patient factors Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to mental health services (not specified includes/predominantly community services?)	Outcome measures: Content of interviews (content analysis) Importance of factors	Main results: 13 patient-related factors identified influencing referral decisions: Type of problem, severity and chronicity, patient wishes and preferences, patient progress and response to treatment, patient needs, control of symptoms, social support, exclusion of physical pathology/ reassurance, patient situation, severity of distress, previous treatment/assessment, effect on family and motivation Three service-related factors: Availability/waiting lists, appropriateness for in-house counselling service, quality of the service, previous experience with service, liaison/feedback, therapist interests and training, setting being familiar to patient	Reported associations between elements for logic model: Patient-, service- and clinician-related factors

12 doctor-related factors:	GP time/availability, doctor–patient relationship, experience, expertise, success of GP treatment, needing assessment/advice, difficulties with a particular patient, workload/emotional involvement, safeguarding career/making mistakes, GP preference for a particular problem/competence, obligation, putting problem in another person's lap	Highest priority given to patient-related factors, all of these received at least moderately high ratings	Differences between GPs apparent in terms of preferences, inclination and confidence to treat psychological problems. Different referral rates among participants, low referrer may take more responsibility for patients/more interest in treating psychological problems; however, high interest could also lead to high referral as better identification of problems

Kvaerner 2007[168] Country: Norway Study design: Cross-sectional Data collection method: Questionnaire Aim: To estimate the proportion of children with otitis media referred from primary to specialist care, study variation in referral pattern and factors that influence GP behaviour Detail of participants (number, any reported demographics): All Norwegian GPs in 2004 ($n = 1633$)	Methods: Questionnaire Control: NA Length of follow-up: NA Response and/or attrition rate: 48% ($n = 1633$) Context (from what/who to what/who): GP to otolaryngologist/ENT department	Outcome measures: Referral routines for otitis media at first visit and at follow-up	Main results: Mean referral for otitis media was 22%, most commonly at follow-up visit. Twenty-seven per cent of children with otitis media were sent to ENT departments and 73% to practising otolaryngologists. Variation in referral pattern among GPs was moderate. GPs with specialty in general medicine had 6% fewer referrals. Separate analysis on referral to practising otolaryngologists showed that GP work load and availability to practising specialists increased referral, whereas availability to hospital services reduced the probability	Reported associations between elements for logic model: Completed specialty in general medicine reduces referrals GP workload and availability of specialist influence referral behaviour
Lakha *et al.* 2011[179] Country: Canada Study design: Cross-sectional Data collection method: Survey Aim: To examine factors associated with family physician referral Detail of participants (number, any reported demographics): 47 family physicians; mean age 48.6 years; most worked in greater Toronto area, 37% worked outside the metropolitan area. Females 45%; time since graduation mean 22.4 years	Methods: A questionnaire-based survey Control: None Length of follow-up: NA Response and/or attrition rate: 32% Context (from what/who to what/who): Family physician to tertiary pain clinic	Outcome measures: Reasons for referral Physician demographics Number of patients seen	Main results: Three most cited reasons for referral were requests for nerve blocks or other injections, desire for the expertise of the programme and concerns regarding opiods Three most prevalent barriers were long waiting lists, patient preference for other treatments and distance from clinic Trend but not significant – the more chronic-pain patients a physician saw the less he or she tended to refer them to pain clinics. Also not significant were family physician age, sex, ethnicity, length of time in practice	Reported associations between elements for logic model: No relationship between family physician demographics and referral

Lambert 2001[175] Country: UK Study design: Cross-sectional Data collection method: Postal survey Aim: To examine the role of GPs in patients with epilepsy Detail of participants (number, any reported demographics): 312 GPs Bristol, 10 from practices with epilepsy nurse specialists	Methods: Questionnaire Control: None Length of follow-up: NA Response and/or attrition rate: 67% Context (from what/who to what/who): GP to specialist epilepsy services	Outcome measures: Views and reported practice	Main results: 49% at least sometimes treated new patients before they were referred, 12% never treated patients before referral 80% of GPs with a nurse specialist at least sometimes treated before referring 16% of GPs reported auditing their management of patients with epilepsy. 60% of those with an epilepsy nurse audited practice 64% replied that they would welcome teaching on epilepsy Only 16.4% felt that joint clinics would be a good idea and 58.6% felt that there was no need for this. However, 66.4% believed that co-operation cards would be useful. 20.8% replied that they would be unnecessary and preferred communication via letters telephone or e-mail. 20% of GPs with specialist nurse wanted joint clinics; however, 80% thought co-operation cards would be useful Note: co-operation cards are described as an overview of the patient – would contain details of epilepsy and seizure types including classification, also medical history, epilepsy history, medications, checklist of counselling regarding driving, employment, etc.	Reported associations between elements for logic model Low number of GPs viewing joint clinics as necessary Impact of having epilepsy nurse in practice

Lewis 2000[260] Country: USA Study design: Qualitative Data collection method: Telephone interview Aim: To investigate patient preference for care by generalists and specialists Detail of participants (number, any reported demographics): 314 patients who had visited their primary care provider in the previous 2 years from 10 sites randomly generated from list. Respondents described as generally well-educated, middle-class, white women. 40% good to excellent health yet many reported frequent visits and hospitalisations	Method: Qualitative telephone interviews Control: None Length of follow-up: None Response and/or attrition rate: NA Context (from what/who to what/who): Primary care provider to specialist	Outcome measures: Views	Main results: Although participants preferred continuity of care from a primary care provider, over half noted that for a new problem they preferred to see a doctor who specialises in that problem Participants valued the freedom to choose their doctor and have unencumbered access to specialists 90% would avoid insurance plans that limited their choice of generalist or specialist Patients asked who they would prefer to see for 15 conditions. Only four for which one-fifth or more indicated a preference to receive care from a specialist – prostate, initiation of birth control, changes in a mole and ingrown toenail	Reported associations between elements for logic model: Applicability to UK? Importance of patient choice of doctor

Little 2004[251] Country: UK Study design: Cross-sectional as part of wider RCT Data collection method: Questionnaires Aim: To explore the impact of patient pressure on doctors' management of patients Detail of participants (number, any reported demographics): 847 patients aged 16–80 years. Five general practices, 30 GPs. Southampton area	Methods: Patients approached while waiting for GP appointment. Completed questionnaire before appointment and after on why appointment and what outcome they hoped for/satisfaction with outcome. Also completed HADS. GPs completed questions following appointment on action taken and whether or not these were needed and pressure they felt from patient Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP referral for patients with depression	Outcome measures: Perceptions of medical need Perception of patient pressure to be referred Numbers referred or not referred	Main results: Doctors' perception of medical need strongest factor determining behaviour during consultation Doctors reported no or only slight need for referral in 22% of those examined Doctors' perception of moderate or definite patient pressure was a predictor of doctors' referral behaviour. It was a stronger predictor than patient expectations/pressure Perceived slight patient pressure to be referred 19% referred 5% not referred (OR 8.99, 95% CI 4.91 to 16.46; $p = 0.994$), perceived moderate or definite pressure 44% referred 1% not referred (OR 125.3, 95% CI 51.3 to 306.5; $p = 0.005$) Patient wish to be referred slight 16% referred 8% not referred (OR 3.34, 95% CI 1.88 to 5.93, $p = 0.796$), patient pressure moderate or definite 28% referred 5% not referred (OR 8.51, 95% CI 4.97 to 14.6; $p = 0.028$)	Reported associations between elements for logic model: Perception of medical need is strongest predictor of referral. However, perceived pressure from patient is a significant factor

Love 2005[302] Country: New Zealand Study design: Cross-sectional Data collection method: Referral data Aim: To describe patterns of variation in referral among GPs, and to establish whether or not variability among practitioners within a geographic area is associated with high levels of utilisation in an area Detail of participants (number, any reported demographics): Claims managed by 2679 GPs	Method: Multilevel analysis of routinely collected primary care data Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to physiotherapy	Outcome measures: Referral to physiotherapy, specialist assessment, radiology, and approval of earnings-related compensation	Main results: The pattern of observed variability is not consistent for different referral activities: groups of GPs within one area may practise consistently in referral for one outcome, but be highly variable for another, while practitioners in other areas can show the reverse pattern The degree of variability among GPs within geographic areas was not significantly correlated at the 95% level with the absolute level of referral to any of the referral options	Reported associations between elements for logic model: No consistent patterns

Malcolm 2008[299] Country: Canada Study design: Cross-sectional Data collection method: Survey (in person, by fax and by mail) Aim: Understanding primary care physicians' perceptions of barriers to specialist diabetes care Detail of participants (number, any reported demographics): 445 primary care physicians included. 177 primary care physicians completed the survey	Method: The survey was developed using the following steps – (1) a multidisciplinary committee was formed to develop the initial concepts to be covered in the survey; (2) an extensive review of the literature was performed; and (3) the list of tools and barriers to be included in the survey was determined Consensus was used to develop the list of tools and barriers, as it was found that the body of literature pertaining to tools for transition was small. The scores for seven preselected barriers to specialist care were recorded Control: None Length of follow-up: None Response and/or attrition rate: 40% response rate Context (from what/who to what/who): Primary care to specialist diabetes care	Outcome measures: Barriers to referral (predefined)	Main results: There was a fairly high degree of spread in these scores for the seven preselected barriers (2 to 6) The results indicate that primary care physicians are conversant with guidelines and evidence but have problems implementing guidelines for three main reasons: lack of patient adherence (6), lack of access to a multidisciplinary team of care providers (5) and lack of patient finances (5) The other barriers were less important: Lack of time (4) Lack of clarity of guidelines (2) Lack of awareness of evidence (2)	Reported associations between elements for logic model: Barriers to referral

Massey 2004[236] Country: UK Study design: Cross-sectional Data collection method: Postal survey Aim: To examine views of access to a physiotherapy service Detail of participants (number, any reported demographics): GPs in Blackpool area; 65% of 50 practices responded	Method: Service had been in operation for 5 years Control: NA Length of follow-up: NA Response and/or attrition rate: 65% return Context (from what/who to what/who): GP to specialist physiotherapy service for patients with incontinence/pelvic floor dysfunction (previously service accessed via GP referral to consultant)	Outcome measures: Views of the GP direct access physiotherapy continence service	Main results: 55% stated that they were aware of the direct access of patients in the service 72% of those aware had referred to the service 94% were satisfied with the service acting as a triage for patients prior to their referral to a relevant consultant 94% stated that specific referral criteria would be useful	Reported associations between elements for logic model: GP lack of knowledge of service; those not aware would refer in the future
McBride 2010[287] Country: UK Study design: Cohort study Data collection method: Patient data from database Aim: To explore variation in referral patterns Detail of participants (number, any reported demographics): 5492 patients with post-menopausal bleeding; 23,121 with hip pain; 101,212 with dyspepsia. 326 general practices	Methods: Health improvement network database with 15 years of data. Referrals solely for non-diagnostic imaging were excluded. Patients with post-menopausal bleeding prescribed hormone-replacement therapy were excluded. Referral within 2 weeks of GP consultation counted Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Record of referral to a specialist	Main results: Reduced odds of referral for post-menopausal bleeding in those patients over 75 years, increased comorbidity reduced likelihood of referral Hip pain: gender, age and level of deprivation impacted on likelihood of referral Dyspepsia: gradient in referral by level of deprivation, referral rates higher over 55 years than under 55 years. Referral least likely in oldest and youngest	Reported associations between elements for logic model: Patient demographic factors and likelihood of referral

McKenna 2005[225] Country: USA Study design: Cross-sectional Data collection method: Postal survey Aim: To explore the impact of knowledge and demographic variables on referral Detail of participants (number, any reported demographics): 460 medicine and family practice physicians. Average age 48 years; 69% male; 71% in private practice. 87% of their time spent in primary care	Methods: 13 case scenarios used 10 appropriate referrals and four inappropriate. Asked to rate the likelihood of referral. Asked to identify skills of specialists from list Control: None Length of follow-up: NA Response and/or attrition rate: 46% Context (from what/who to what/who): Family practice/internal medicine physicians to physical medicine and rehabilitation	Outcome measures: Referral intention Self-reported number of referrals Knowledge of skills of physical and rehab specialists	Main results: Females more likely to refer than males ($p = 0.003$) Physicians with greater understanding of the practice of the specialists were more likely to refer ($p = 0.003$)	Reported associations between elements for logic model: Gender and referral Knowledge and referral

Mitchell 2012[186] Country: Australia Study design: Cross-sectional Data collection method: Semistructured telephone interviews and an online survey Aim: To examine Australian private practice dietitians' relationships with GPs and practice nurses as a factor that influences dietetic referrals Detail of participants (number, any reported demographics): $n = 52$ (interviews) and $n = 90$ (survey) with GPs ($n = 11$) and practice nurses ($n = 12$) from the 'GP Access' Division of General Practice	Method: Mixed-methods approach. Semistructured telephone interviews and an online survey Control: NA Length of follow-up: March to July 2007 Response and/or attrition rate: Telephone interviews were conducted with 52 private practice dietitians (22% response rate); 18 dieticians from divisions providing a high number of chronic disease management consultations (30% response rate); and 37 providing a low number (20% response rate) Context (from what/who to what/who): GP referral to dieticians	Outcome measures: Practitioner views	Main results: GPs' relationships with dieticians were believed to be the primary influencing factor on referral, provided by 81% of survey dieticians and 25% of interview dieticians. The most common means of initially forming relationships with GPs were face-to-face introduction (48%) and introductory letters (37%) Patient feedback via letter, fax or e-mail was the most popular method of maintaining relationships with GPs (77%). Meeting with GPs in person was believed to be the most effective activity in building relationships GPs and increasing referral rates (42%) Referral was made easier for GPs by providing paper (37%) or electronic (19%) referral forms and contact details (19%). The majority of GPs and dietitians believed that the 'Allied Health Services Under Medicare' made it easier to refer to a dietitian	Reported associations between elements for logic model: Influence of referral relationship on referral Ease of referral and paper or electronic referral forms

Montgomery 2006[180] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To examine factors influencing GP referral Detail of participants (number, any reported demographics): 51 GPs, 25 urban and 26 rural; 43 male; average 50 years old; mean practice size of 2.3 partners. Median distance 15 miles from nearest dialysis centre	Methods: Interviews included case scenarios depicting patients in varying stages of renal failure Control: None Length of follow-up: NA Response and/or attrition rate: 65% response rate Context (from what/who to what/who): GP to nephrologist or other specialist for end-stage renal failure	Outcome measures: Referral patterns	Main results: Neither GP characteristics nor patient characteristics affected referral pattern No patient age difference in referral patterns ($\chi^2 = 0.73$) Referral rates varied widely between cases 0–32 after first laboratory test was available to GP Referral rates did not differ by GP sex, practice size or experience with renal patients	Reported associations between elements for logic model: Diverse management patterns not explained by patient or GP factors
Moore *et al.* 2000[205] Country: USA Study design: Cross-sectional Data collection method: Survey Aim: To examine primary care provider referral decisions Detail of participants (number, any reported demographics): 504 primary care providers in state of Ohio	Methods: 20-item survey Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Primary care provider to neurologist	Outcome measures: Rate of referral Self-reported confidence with seizure patients	Main results: Two groups emerged – high referrers and low referrers. Difference between the two groups was apparent in answers to questions regarding who initiated drug therapy, and their comfort level Minority of physicians rate themselves as comfortable with seizure patients; these tend to refer less than 50% of their patients. Those less comfortable refer more than 50% of patients	Reported associations between elements for logic model: Physician comfort dealing with patients and referral

Morgan 2007[210] Country: UK Study design: Qualitative Data collection method: Interviews Aim: Examines influences on GPs' referral for headache in the absence of clinical indicators Detail of participants (number, any reported demographics): Semistructured interviews with 20 GPs. Eighteen urban and suburban general practices in the South Thames area, London	Methods: Purposive sample comprising GPs with varying numbers of referrals for headache over a 12-month period Control: None Length of follow-up: 12-month study Response and/or attrition rate: Forty GPs were approached. Two refused to be interviewed, 13 had left the practice and five were unavailable owing to maternity leave, sick leave or annual leave Context (from what/who to what/who): GP referral for headache	Outcome measures: Practitioner views	Main results: All GPs reported observing patient anxiety and experiencing pressure for referral. Readiness to refer in response to pressure was influenced by characteristics of the consultation, including frequent attendance, communication problems and time constraints. GPs' accounts showed variations in individual's willingness or 'resistance' to refer, reflecting differences in clinical confidence in identifying risks of brain tumour, personal tolerance of uncertainty, views of patients' 'right' to referral and perceptions of the therapeutic value of referral. A further source of variation was the local availability of services, including GPs with a specialist interest and charitably funded clinics	Reported associations between elements for logic model: Link GP expertise and referral GP confidence and referral, tolerance of risk/anxiety Link patient pressure and referral Situational factors increasing readiness to refer include the local availability of sources of referral
Morsi 2012[200] Country: USA Study design: Survey Data collection method: Web-based survey Aim: To characterise factors influencing PCP hospital referral choice Detail of participants (number, any reported demographics): 92 PCPs affiliated to three hospitals in Massachusetts	Method: Web survey Control: None Length of follow-up: NA Response and/or attrition rate: 47% Context (from what/who to what/who): Primary care provider to hospital	Outcome measures: Factors reported as important in referral decisions	Main results: Factors considered important – Familiarity with the hospital (70%) Patient preference (62%) Arrangement with hospital (62%) Publicly available quality measures 'not at all important' to 42% No physicians reported ever using quality information to make a referral decision or discussing it with patients No physician factors were associated with awareness of publicly reported data	Reported associations between elements for logic model: Quality of service offered by a provider not associated with referral decisions

Mulvaney 2005[297] Country: UK Study design: Cross-sectional Data collection method: Survey Aim: To examine the relationship between private and NHS outpatient referral rates accounting for their association with deprivation Detail of participants (number, any reported demographics): 10 general practices	Method: A prospective survey of GP referrals to private and NHS consultant-led services between 1 January and 31 December 2001 from 10 general practices in the Trent Focus Collaborative Research Network, UK. Patient referrals were aggregated to give private and NHS referral rates for each electoral ward in each practice Control: NA Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GP to specialist	Outcome measures: NHS referral Private referral Patient characteristics	Main results: Of 17,137 referrals, 90.4% (15,495) were to the NHS and 9.6% (1642) were to the private sector Private referral rates were lower in patients from the most deprived fifth of wards compared with the least deprived fifth (rate ratio 0.25, 95% CI 0.15 to 0.41; $p < 0.001$), whereas NHS referral rates were slightly higher in patients in the most deprived fifth of wards (rate ratio 1.18, 95% CI 0.98 to 1.42; $p = 0.08$) both after age standardisation and adjustment for practice The NHS referral rate was significantly higher (rate ratio 1.40, 95% CI 1.15 to 1.71; $p = 0.001$) in wards with private referral rates in the top fifth compared with the bottom fifth after adjustment for deprivation and practice	Reported associations between elements for logic model: Increased private health-care activity does not reduce the demand for NHS care
Musila 2011[255] Country: UK Study design: Cross-sectional Data collection method: Guideline development group rated appropriateness Aim: An innovative approach to develop a referral guideline for patients with chronic knee pain that explicitly incorporates patients' preferences Detail of participants (number, any reported demographics): $n = 12$	Method: A guideline development group of 12 members including patients, GPs, orthopaedic surgeons and other health-care professionals used formal consensus development informed by systematic evidence reviews. They rated the appropriateness of referral for 108 case scenarios describing patients according to symptom severity, age, body mass, comorbidity and referral preference. Appropriateness was expressed on scale from 1 ('strongly disagree') to 9 ('strongly agree') Context (from what/who to what/who): GP to specialist for patients with chronic knee pain	Outcome measures: Appropriate referral	Main results: Ratings of referral appropriateness were strongly influenced by symptom severity and patients' referral preferences. The influence of other patient characteristics was small. There was consensus that patients with severe knee symptoms who want to be referred should be referred and that patient with moderate or mild symptoms and strong preference against referral should not be referred. Referral preference had a greater impact on the ratings of referral appropriateness when symptoms were moderate or severe than when symptoms were mild	Reported associations between elements for logic model: Referral decisions for patients with osteoarthritis of the knee should be guided only by symptom severity and patients' referral preferences

Naccarella *et al.* 2008[169] Country: Australia Study design: Survey Data collection method: Survey of project officers who had carried out demand management projects Detail of participants (number, any reported demographics): Data available from 89 projects (81%)	Methods: Questionnaire Control: None Length of follow-up: None Response and/or attrition rate: Context (from what/who to what/who): GPs to mental health care	Outcome measures: Types of demand management used Views	Main results: Informing and training GPs was most popular demand strategy used followed by putting in place systems and/or administrative procedures Monitoring and limiting referrals was most commonly reported as the most useful strategy (29%) followed by putting in place systems and/or administrative procedures (24%)	Reported associations between elements for logic model: Types of demand management Views regarding which most successful – system changes and referral

Nandy 2001[204] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To analyse GP decision-making processes with patients with minor mental illness Detail of participants (number, any reported demographics): 23 GPs in London and Essex. Mean age 44 years, eight women, 20 principals	Methods: Grounded theory analysis and framework. Recording quality too poor to analyse for two interviews Control: None Length of follow-up: NA Response and/or attrition rate: 34 approached Context (from what/who to what/who): GP to mental health specialist for minor mental health issues	Outcome measures: Themes	Main results: Two strategies identified – containment and conduit. Containment was adopted by GPs who saw their role as preventing burden on other agencies and thus tended not to refer. GPs adopting a conduit strategy say their role as diagnostic and then triage with patients best managed by others. Many GPs used both strategies; majority initially see patients themselves then refer sometimes. Saw themselves as doing both but leaning towards one or the other Reasons for referral – lack of progress, poor rapport with patient. Containment enhanced by having an interest in mental health and having confidence in dealing with mental health Referrals of two types – proactive 'referrals to' (patient desire to be referred or other staff have better skills) and reactive 'referrals away' (failure of GP management or lack of time). Referrals away predominated Emotive as well as rational responses informed GP decisions. Feelings of frustration or irritation. Referrals to tended to be thought through whereas referrals away could be more emotional or instinctive	Reported associations between elements for logic model: GP strategies and emotions and referral

Navaneethan 2010[278] Country: USA Study design: Cross-sectional Data collection method: Retrospective case review, and survey Aim: To assess referral factors and compare perceptions with factors Detail of participants (number, any reported demographics): 816 patient records reviewed; 400 primary care providers surveyed	Methods: Retrospective case review, and survey Control: None Length of follow-up: NA Response and/or attrition rate: 25% of primary care providers completed the survey Context (from what/who to what/who): Primary care provider referral of patients with chronic kidney disease to nephrologist	Outcome measures: Factors predicting referral	Main results: Non-referred patients were likely to be older (over 65 years $p < 0.05$, OR 3.5, 95% CI 2.3 to 5.2) Non-referred patients likely to be female (OR 1.4, 95% CI 1.0 to 2.0) Non-referred patients likely to be of non-white race (OR 2.6, 96% CI 1.5 to 4.5) Patients with comorbidities also less likely to be referred 62% of primary care providers unfamiliar with referral guidelines	Reported associations between elements for logic model: Patients demographics as predictor of referral Physician low knowledge of guidelines
O'Byrne *et al.* 2010[243] Country: UK Study design: Cross-sectional Data collection method: Analysis of GP letter information Detail of participants (number, any reported demographics): Letters for 50 new patient referrals reviewed by two consultants	Methods: Consultant read the referral letter and predicted which diagnostic investigations they would order based on the letter content. Then saw patient and compared expectations with actual Control: None Length of follow-up: None Response and/or attrition rate: Context (from what/who to what/who): GP to respiratory consultants	Outcome measures: Number of changes in recommended diagnostic investigations	Main results: 72% of patients required an alteration to the diagnostic investigations thought to be necessary Specific content omitted related to allergies and comorbidities The number of tests ordered on basis of referral letter was substantially fewer than those that were thought necessary at the consultation. Tests planned were less diverse and tended to lack specificity than those actually recommended by specialist Review of literature on missing content of referral letters Useful references for issues with direct access systems, standardised referrals/ guidelines/electronic systems	Reported associations between elements for logic model: Referral information is insufficient to provide a reliable basis for selection of tests prior to consultation Suggests that a straight-to-test system based on referral information would result in redundant diagnostic testing and repeated hospital attendance for correct tests to be carried out

O'Neill 2005[170] Country: USA Study design: Cross-sectional Data collection method: Survey Aim: To explain variation in physicians' practice patterns in terms of physician personal characteristics, practice setting, patient population, and managed care involvement Detail of participants (number, any reported demographics): 2455 primary care physicians. The average age of physicians was 47 years, with an average of 15 years in practice	Method: Data on 2455 primary care physicians were derived from the Community Tracking Study Physician Survey (1996–7). Factor scores were determined based on responses to three clinical scenarios that represent discretionary medical decisions. These scenarios include a specialist referral for benign prostatic hyperplasia, prescription drugs for elevated cholesterol and an office visit for vaginal discharge Control: NA Length of follow-up: NA Response and/or attrition rate: The Community Tracking Survey had a response rate of 65% Context (from what/who to what/who): GP to specialist	Outcome measures: Physician personal characteristics, practice setting, patient population, and managed care involvement	Main results: Physician age, being a foreign medical school graduate, being a solo practitioner and having a larger proportion of Medicaid patients were all associated with higher factor scores, a greater likelihood of ordering a service Being board certified was associated with lower factor scores Managed care involvement was not a significant predictor of factor scores All of the predictor variables were significantly correlated with factor score ($p < 0.01$) except gender, percentage of revenue from Medicare and percentage of capitated revenue. Board certified was negatively correlated with age (–0.296) and foreign medical school graduate (–0.268). Percentage of patient revenue from managed care was negatively correlated with factor score (–0.052), age (–0.159), and solo practice (–0.237) and positively correlated with board certified (0.101), female gender (0.146), and institutional setting (0.277). Percentage of Medicaid revenue was positively associated with foreign medical school graduate (0.133) and institutional setting (0.219) and negatively associated with board certified (–0.081)	Reported associations between elements for logic model: Unclear

Olson *et al.* 2012[206] Country: Canada Study design: Cross-sectional Data collection method: Postal survey Aim: To assess the relationship between family physicians knowledge of radiotherapy and referral Detail of participants (number, any reported demographics):	Methods: Postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 33% Context (from what/who to what/who): Family physician to palliative radiotherapy	Outcome measures: Physician self-reported knowledge	Main results: Strong relationship between family physician referral and self-assessed or tested knowledge ($p < 0.001$ and $p < 0.010$)	Reported associations between elements for logic model: Physician knowledge level and referral

Pfeiffer 2011[138] Country: USA Study design: Retrospective analysis of clinic data Data collection method: Analysis of hospital patient data from locations with primary mental health services and those without over a 1-year period Aim: To determine whether or not implementation of primary care mental health services is associated with differences in specialty mental health clinic use Detail of participants (number, any reported demographics): 49,957 primary care patients with new visits to specialty mental health clinics. Mean age 55.7 years; male 93%. 118 primary care facilities offering specialist mental health services and 142 without	Intervention: Veterans Health Administration, primary care mental health services providing collocated collaborative mental health specialists and managers screening and managing common mental health conditions (depression, alcohol misuse, post-traumatic stress disorder) Control: Primary care facilities not having an integrated mental health service Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Primary care services to specialty mental health care	Outcome measures: New visits to specialty mental health clinics Mental health diagnosis Illness severity	Main results: Initiation of treatment at specialty mental health clinic did not differ between primary care with mental health facilities and those without the service (5.6% vs. 5.8%) Attendance at a primary care service for mental health was not a predictor of total number of specialist mental health clinic visits Author conclusion: provision of primary care mental health service not associated with differences in new use of specialty mental health services or diagnoses received	Reported associations between elements for logic model: No impact on referrals from primary care mental health service to specialist service

Philichi 2010[202] Country: USA Study design: Cross-sectional Data collection method: Postal survey Aim: To assess treatment strategies and referral decisions Detail of participants (number, any reported demographics): 237 primary care providers. 81% paediatricians, 19% nurse practitioners	Methods: Cross-sectional postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 38% Context (from what/who to what/who): GP to paediatric gastroenterology	Outcome measures: Clinical diagnosis Reasons for referral No practitioner demographics collected	Main results: Most frequently identified reason for referral was patient unresponsiveness to treatment (71%) Second most frequent: parents want a second opinion (15%) Third: to rule out organic cause (9%) Fourth: management too time-consuming (5%)	Reported associations between elements for logic model: Patient factors and referral

Pomeroy 2010[176] Country: Australia Study design: Cross-sectional plus qualitative Data collection method: Interviews and postal survey Aim: To describe GP decision-making processes Detail of participants (number, any reported demographics): 30 GPs in Victoria interviewed; 14 male; 2–5 GPs in practice 15, 6–11 GPs in practice 10. 248 GPs surveyed	Methods: Mixed methods – cross-sectional postal survey and qualitative interviews Control: None Length of follow-up: NA Response and/or attrition rate: 30% Context (from what/who to what/who): GP to dietitian	Outcome measures: Themes	Main results: Synthesising management information – number and complexity of health problems impacted on whether nutrition intervention was prioritised as high or delayed until later. Reasoning seemed based on doctor's previous experiences. Presence of multiple and complex health problems influenced referral for two-thirds of GPs Patient age not viewed as a causal factor for referral. No association between doctor's age and referral Forecasting outcomes – capacity of patient to implement changes, potential effect Planning management – patient choice of treatment, patient willingness to attend Actioning the referral – GP knowledge of local service, matching patient with service, access, transport, interpreter services Concept model developed – doctor's clinical knowledge – patient's nutrition history – patient's clinical profile (risks) – doctor's clinical experience and intuition Note: paper does not report the results of the survey	Reported associations between elements for logic model: Complexity of issues and referral Age and referral Patient choice GP previous experience and knowledge of service

Pryor and Knowles 2001[215] Country: Australia Study design: Cross-sectional Data collection method: Survey Aim: To explore whether GP attitudes to psychologists impacts on referral Detail of participants (number, any reported demographics): 105 GPs in Victoria, Australia; 69% female; 96% had referred to a psychologist	Methods: 33-item questionnaire including questions regarding competence, how likely were to refer, reasons would not refer Control: None Length of follow-up: NA Response and/or attrition rate: 66% Context (from what/who to what/who): GP to psychology	Outcome measures: Perceived competency Referral rate GP demographics	Main results: High-referring GPs rated psychologist professional competency and value to the community higher than low-referring GPs Female GPs referred more frequently than male GPs. GP age predictor of number of referrals (36–55-year band higher) No significant difference metropolitan and regional GPs Perception of professional competency not a barrier to referral, factors of cost act as barrier	Reported associations between elements for logic model: Younger female GPs with positive attitude to psychology referred more

Ramanathan *et al.* 2011[188] Country: Australia Study design: Cross-sectional Data collection method: Postal survey Aim: To describe GP referral patterns and factors Detail of participants (number, any reported demographics): 1402 GPs – 771 metropolitan and 631 rural or remote	Methods: Self-completed or online questionnaire including 128 case vignettes of a patient with gynaecological symptoms. Each GP received 12 vignettes, Telephone interviews had been used to add to the clinical guidelines and develop clinical variables Control: None Length of follow-up: NA Response and/or attrition rate: 45.5% Context (from what/who to what/who): GP to gynaecologist or gynaecological ontologist	Outcome measures: Referral decision Diagnosis of probability of patient having cancer Demographic data Practice and service data	Main results: Metropolitan GPs more likely to refer than rural GPs for endometrial cancer (68.4% vs. 61.1%) Best predictors of referral were age of patients, results of ultrasound and duration of symptoms Practitioners with more than 15 years of experience were more likely to refer vignettes of women with ovarian cancer Patient factors were better predictors of referral behaviour than the characteristics of GPs. Age of patient and duration or symptoms were important determinants of referral Greater variation in referral practice for endometrial cancer for which there are no Australian guidelines (68% of vignettes with high probability of cancer were referred compared with 83% for ovarian cancer and 80% for cervical cancer for which guidelines are available)	Reported associations between elements for logic model: Location of GP and referral Availability of guidelines and referral practice

Ramchandiani 2002[247] Country: UK Study design: Cross-sectional Data collection method: Postal survey Aim: To seek views of pooled waiting lists Detail of participants (number, any reported demographics): 50 GPs in Birmingham. 776 consultant opthalmologists. 85 patients (55 female, mean age 75.7 years)	Methods: Cross-sectional postal survey Control: None Length of follow-up: NA Response and/or attrition rate: 64% Context (from what/who to what/who): GP to ophthalmology for patients with cataracts	Outcome measures: Views	Main results: 7.5% of consultants reported using pooled lists; 73% patients would move between consultants if wait became excessive 30% of consultants in favour of pooled lists and 67% against, 3% do not know. Pooled lists described as being suitable only for routine cases, being a loss of responsibility for care, devaluing the doctor–patient relationship and resulting in loss of consultant control. 26 complex case unsuitable, 16 different operating techniques/standards, 14 devalues operation, 13 increases disparity in workload 92% of GPs for pooled lists, 8% against. 40% of GPs referred to named consultant, 56% to a department. 92% of GPs happy for patient to be referred to another consultant if they would be seen sooner. 88% would switch if patient could be seen 1 month sooner in a wait of 7 months; 8% would want same surgeon whatever waiting time 82.4% of patients for pooled lists, 17.6% against. 82% of patients reported that they would want operation to be done sooner if performed by another surgeon of equal ability. 79% would change consultant for a 1-month reduction in waiting time if wait was 7 months. 18% would not wish to change consultant at all. 73% of patients did not know the name of their consultant	Reported associations between elements for logic model GPs and patients more in favour of pooled waiting lists, consultants more against

Ridsdale 2007[266] Country: UK Study design: Cohort Data collection method Aim: To describe and compare headache patients managed in primary care with those referred to neurologists Detail of participants (number, any reported demographics): Eighteen general practices in south-east England 488 eligible patients consulting GPs with primary headache over 7 weeks and 81 patients referred to neurologists over 1 year	Method: This study examined 488 eligible patients consulting GPs with primary headache over 7 weeks and 81 patients referred to neurologists over 1 year. Headache disability was measured by the Migraine Disability Assessment Score, headache impact by the Headache Impact Test, emotional distress by the Hospital Anxiety and Depression Scale and illness perception was assessed using the Illness Perception Questionnaire Control: Non-referred patients Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to neurologist	Outcome measures: Referral Clinical measures	Main results: Participants were 303 patients who agreed to participate. Both groups reported severe disability and very severe impact on functioning Referred patients consulted more frequently than those not referred in the 3 months before referral ($p = 0.003$) There was no significant difference between GP-managed and referred groups in mean headache disability, impact, anxiety, depression or satisfaction with care The referred group were more likely to link an increased number of symptoms to their headaches ($p = 0.01$), to have stronger emotional representations of their headaches ($p = 0.006$), to worry more ($p = 0.001$), and were made anxious by their headache symptoms ($p = 0.044$)	Reported associations between elements for logic model: Referral is not related to clinical severity of headaches, but is associated with higher consultation frequency and patients' anxiety and concern about their headache symptoms

Ringard 2010[164] Country: Norway Study design: Cross-sectional Data collection method: Two surveys Aim: To examine referral patterns to a local rather than further away providers Detail of participants (number, any reported demographics): Distributed to all GPs in Norway. First 1635 GPs, second 1858 GPs. Mean age 48 years	Method: Survey carried out in 2004 and again in 2006 of referrals for hip replacement, knee surgery, back pain treatment Control: None Length of follow-up: NA Response and/or attrition rate: 48.4% first and 50.9% second Context (from what/who to what/who): GP to hospital	Outcome measures: Proportion of patients referred to local vs. alternative or private hospital	Main results: Increase in average referrals for all diagnoses between 2004 and 2006; however, only increase in referrals for back pain significantly different ($p = 0.05$) Few variables relating to GP individual characteristics or the practice characteristics were significantly related to referral pattern. Exception was the GPs level of expertise in back pain and hip surgery where GPs with a specialty within general medicine were less likely to refer patients to an alternative hospital. Practising in an area with an older population or more people with disability payments was associated with greater likelihood of referring to the local hospital. Practising in an area with a highly educated population significantly increased the likelihood of referring elsewhere for knee surgery only Long waiting times increased likelihood of referring away but only for knee and hip surgery Referral also influenced by having a formal arena for co-operation and exchange of information, frequency of GPs attending formal meetings and having a positive perception of the collaboration (all less likely to refer away)	Reported associations between elements for logic model: Variation in referral behaviour different diagnoses Formal co-ordinative mechanisms led to a stronger referral relationship

Robinson and Taylor 2010[288] Country: New Zealand Study design: Cross-sectional Data collection method: Referral data analysis Aim: To assess the factors associated with allocation to urgent or semiurgent appointment Detail of participants (number, any reported demographics): 128 new patients' data; 69% female; average age 53 years	Methods: Data extracted from medical records and GP referral letters. Time to treatment calculated Study service carries out urgent vs. semiurgent triage for new referrals Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to rheumatology	Outcome measures: Predictors of an urgent allocation as compared with a semiurgent allocation of a referral	Main results: The only factors which influenced whether patients were triaged by the rheumatology service as urgent or semiurgent was GP assessment of urgency (OR 13.34, 95% CI 2.20 to 81.02) and patient being of a younger age No evidence of triaging based on known prognostic indicators by service Need for interventions to improve information contained within referral from GP and/or education to improve triage at point of receipt of referral	Reported associations between elements for logic model: Triaging of referrals at point of receipt

Rosemann 2005[211] Country: Germany Study design: Observational Data collection method: Questionnaires completed after referral Aim: Describing the experiences of consultants, GPs and patients with referrals from primary care to medical specialist care Detail of participants (number, any reported demographics): Referrals of 26 GPs from 25 practices in Marbach, a rural region in the south of Germany, were studied	Method: GPs, consultants and patients completed short structured forms to document factual characteristics of each referral and their experiences with the referral. GPs and patients completed forms before and after the referral was made, while the consultants completed forms after the patient had consulted them Control: NA Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): Medical specialists	Outcome measures: Practitioner view Patient views	Main results: Overall, consultants were very positive about appropriateness of the referral (91%). They were somewhat more critical regarding the information provided on the patients' medical history (61%) and prescriptions (48%) In 258 referrals (63%) GPs perceived clear diagnostic benefits, while in 202 referrals (49%) they perceived clear treatment benefits. GPs' experiences were more positive if the GP's purpose was to reduce diagnostic uncertainty (beta = 0.318, $p < 0.001$) or if the purpose was to exclude serious illness (beta = 0.143, $p < 0.010$) Other purposes of the referral had no impact on their experiences Patients' expectations regarding the referrals mostly referred to diagnosis, including increased diagnostic certainty (80%), detailed information about the illness (66%) and exclusion of serious illness (62%). They were overall satisfied with the referral (83%). Their experiences with the referral were more positive if the initiative for the referral came from the physician (beta = 0.365, $p < 0.000$)	Reported associations between elements for logic model: Patients were most positive if the physician had initiated the referral Lack of content in referral letter Purpose of the referral to reduce diagnostic uncertainty or exclude serious illness

Rosen 2007[252] (King's Fund Report) Country: UK Study design: Qualitative Data collection method: Telephone interviews and focus groups Aim: To seek GP views regarding making choices in referral Detail of participants (number, any reported demographics): GPs in Suffolk, Westminster, Haringey, Somerset, Colchester and Central Cheshire	Methods: Qualitative analysis of telephone interviews and focus groups Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Any specialist	Outcome measures: Views	Main results: GPs vary considerably in the extent to which they actively support patient choice Most GPs make choices on the patient's behalf (with or without Choose and Book) unless the patient expresses a preference. They will typically only try to over-ride patient preferences in order to steer them towards excellent providers or away from providers about whom they have concerns Very few GPs had used Choose and Book to actively engage patients in discussion about choice of provider Four factors influence the degree to which GPs support patient choice: the availability and quality of formal and informal information about services; GPs' views of their professional role; patient preferences; and local PCT policies that may restrict choice	Reported associations between elements for logic model: Influence of GPs' informal knowledge about local services Lack of trust in formal data Preference for referring to named consultant Different levels of support for patient choice

			Patients and GPs seek overlapping but different characteristics when choosing a hospital. GPs' advice to patients typically balances soft information about clinical quality with patient preferences or published data about waiting times and convenience of access The referral management centre opened by one PCT was seen to restrict choice Early experiences of Choose and Book have raised particular concerns about not being able to refer to a named consultant and about choices that are excluded by the PCT but highly desired by patients In terms of their role in supporting choice, GPs broadly fell into three groups – enthusiasts, sceptics and paternalists Views differed on the value of developing support services, such as choice advisers or health advisory centres, to support patient choice There was no consensus about the type of information GPs wanted to support patient choice or about how it should be presented The distrust of formal information was countered by a preference for soft, informal sources of information GPs recognised that in reality both formal and informal information was incomplete and unreliable. They took a pragmatic approach to combining the two in making referral decisions

For all GPs, the single most important equity issue was access and the constraints of geography and transport. This was felt most acutely by GPs in rural areas, but was present even for GPs in inner cities whose populations were deprived or elderly

Many GPs do not see choice as an equity issue because they do not see it as providing benefit for patients

Choose and Book systems should include the option to refer to a named consultant as a default setting that is removed only as a result of a specific local decision

Where referral management centres exist, there should be an explicit policy about the range of advice that can appropriately be provided and the way it is imparted to ensure that it complements advice from the GP or other referring clinicians

Performance data about different providers should be available in multiple formats with the option for online information users to manipulate the data into the format of their choice. As data sets are developed, they should be piloted to test both their clarity and their credibility before they are widely disseminated

Rowlands 2001[182] Country: UK Study design: Qualitative Data collection method: video transcripts Aim: To investigate the effect of in practice meetings on practice referral rates Detail of participants (number, any reported demographics):	Method: Implementation and evaluation of existing guidelines on the use of neurophysiological tests in non-acute migraine patients: a questionnaire survey of neurologists and primary care physicians. Subsequent to a RCT education intervention Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Referral	Main results: There was no alteration of practice referral rate following the education intervention. The qualitative study highlighted the complexity of decision-making in general practice and likely impact of historical background and internal and external pressures on referral	Reported associations between elements for logic model: Unclear
Rushton *et al.* 2002[183] Country: USA, Canada and Puerto Rico Study design: Cross-sectional Data collection method: Analysis of prior data from provider survey, parent survey and patient data Aim: To examine primary care provider referral patterns Detail of participants (number, any reported demographics): 4012 patients in the child behaviour study who had an identified psychosocial problem. Provider data and parents	Methods: Cross-sectional analysis of patient data Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): PCP referral for child psychosocial services	Outcome measures: Factors associated with referral	Main results: Factors associated with likelihood of referral were patient factors (severity, type of problem, academic difficulties, prior mental health service use, parent agreement with plan, visit time of more than 20 minutes, comorbidity) and family factors (mental health referral of parent, low maternal education, family dysfunction) None of the provider factors were significant: gender, age, specialty, behavioural training, solo practice, rural population and geographic location Clinicians mentioned barriers to referral; however, these were rarely reported as influencing individual management decisions	Reported associations between elements for logic model: Importance of patient-related factors, lack of association with physician factors Report of obstacles to referral but these not influencing individual referrals

Ruston 2004[194] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To explore referral decision-making by GPs Detail of participants (number, any reported demographics): 85 women newly referred to specialist breast clinic in one health authority. Health authority had higher than average incidence of breast cancer and lower than average survival rates 85 GPs of the women referred, 49 male, 36 female; most trained in London; been in practice 1–10 years; 35 from practices with five or more partners	Methods: Interviews with patients and their GP analysed and compared Number of hours: NA Delivered by who? Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist breast clinic	Outcome measures: Reasons for referring	Main results: None of GPs reported using referral guidelines. Considered of theoretical rather than practical relevance and therefore did not adequately address the fact that practitioners deal with individual patients with individual characteristics Respondents perceived guidelines covered clinical aspects only and neglected other factors Defensive strategies described by GP – risk to the woman of not referring when breast cancer was a serious disease and risk of patient resorting to litigation if not referred and problem found later	Reported associations between elements for logic model: Lack of use of guidelines Defensive practice, fear of litigation

Samant 2007[234] Country: Canada Study design: Cross-sectional Data collection method: Survey Aim: To investigate the factors influencing radiotherapy referral among family physicians Detail of participants (number, any reported demographics): 400 physicians in eastern Ontario	Method: A 30-item survey was developed to determine palliative radiotherapy knowledge and factors influencing referral. It was sent to 400 physicians in eastern Ontario (Canada) and the completed surveys were evaluated Control: None Length of follow-up: None Response and/or attrition rate: 50% Context (from what/who to what/who): GP referral for radiotherapy	Outcome measures: Factors affecting referral	Main results: The overall response rate was 50%, with almost all physicians seeing cancer patients recently (97%) and the majority (80%) providing palliative care Approximately 56% had referred patients for radiotherapy previously and 59% were aware of the regional community oncology programme Factors influencing radiotherapy referral included the following: waiting times for radiotherapy consultation and treatment, uncertainty about the benefits of radiotherapy, patient age, and perceived patient inconvenience Physicians who referred patients for radiotherapy were more than likely to provide palliative care, work outside urban centres, have hospital privileges and have sought advice from a radiation oncologist in the past A variety of factors influence the referral of cancer patients for radiotherapy by family physicians, and addressing issues such as long waiting times, lack of palliative radiotherapy knowledge and awareness of Cancer Centre services could increase the rate of appropriate radiotherapy patient referral	Reported associations between elements for logic model: Unclear

Scheeres 2007[163] Country: the Netherlands Study design: Cross-sectional Data collection method: Survey Aim: Investigated the impact of an informational intervention among GPs about a new treatment with cognitive–behavioural therapy for chronic fatigue syndrome (CFS) in a mental health centre Detail of participants (number, any reported demographics): 301 GPs	Method: 301 GPs, who all had received written information about chronic fatigue syndrome four times, and who partly had also visited an informational group session, completed a short questionnaire survey on chronic fatigue syndrome knowledge and attitudes. Referral data were obtained from the mental health centre Control: NA Length of follow-up: NA Response and/or attrition rate: 67% response rate Context (from what/who to what/who): GP referral to mental health	Outcome measures: GP knowledge and attitude	Main results: During 16 months 22% of all GPs in the concerning region had referred at least one CFS patient Concerning knowledge and attitude, the survey results showed that 70% of the GPs had remembered the intervention's main message, namely the new treatment possibility These informed GPs reported better knowledge and more positive attitudes towards CFS than the non-informed GPs, who had not seen and read the intervention's information	Reported associations between elements for logic model: This study showed that disseminating written materials can be a useful method for stimulating GPs to refer

Shadd 2011[263] Country: Canada Study design: Retrospective data analysis Data collection method: Analysis of electronic health record database Aim: To analyse referral patterns and variance in referral rates Detail of participants (number, any reported demographics): Records of 33,998 patients from 10 primary care providers. All patients who visited their family practice 2007–8	Method: Data extracted from electronic health records Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Primary care to any specialist	Outcome measures: Referrals to specialist following visit to primary care provider	Main results: 31.3% of patients had one or more referrals. Overall rate 455 per 1000 patients per year Rates higher for females, older patients, and rural practices Referral rate from rural practices was higher than from urban (424/1000 $p = 0.0001$) Referral rate varied by specialty. Highest general surgery, obstetrics and gynaecology and orthopaedic surgery. Differed if analysed by gender/age band Referral rate correlated with number of primary care providers visits 92% of the variance in referral rates was attributable to the patient (rather than the practice). Patient level variance 0.574 with SE 0.022 and practice level 0.051 with SE of 0.023	Reported associations between elements for logic model: Variance in referral rate predominantly due to patient difference

Sigel 2004[198] Country: UK Study design: Qualitative Data collection method: Interview Aim: How do GPs manage mental health problems Detail of participants (number, any reported demographics): 10 GPs in one locality, seven male, aged 38–60 years, years in practice 9–26	Methods: Qualitative. Semistructured interviews Control: None Length of follow-up: NA Response and/or attrition rate: 32% response rate Context (from what/who to what/who): GP referral for psychological problems	Outcome measures: Perceptions of referral process	Main results: Referral decisions made when GPs perceive that they have reached the limits of their capabilities for treating a problem, taking account of patient suitability for therapy and access to services. Some occasions GPs referred without treating first when they felt out of their depth Reasons for not referring on were when problem was perceived as self-limiting or patient was too upset to cope with therapy Referral decisions influenced by views of psychological problems and therapies and by GPs' professional interactions with psychologists Patient suitability defined in terms of patient preference, and patient characteristics (e.g. insight and ability to articulate and willingness to engage)	Reported associations between elements for logic model: GP individual decision-making and referral Patient characteristics and referral
Soerensen 2009[298] Country: Denmark Study design: Cross-sectional Data collection method: Practice data Aim: To explore the association between patients' socioeconomic status and their referral from general practice to specialised health care Detail of participants (number, any reported demographics): N/R	Method: Multiple regression analysis was used on cross-sectional data on general practice referral rates for all Danish general practices in year 2006 Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to specialist	Outcome measures: Referral Patient characteristics	Main results: The models explained between 26% and 45% of the variation in general practice referral to specialised care Adjusting for access to specialised care (local supply of hospitals and practising specialists) reduced the association between socioeconomic factors and referral rates The results suggest that persons with high socioeconomic status are referred more to practising specialist than persons with low socioeconomic status and that the latter are referred more to hospital care than the former	Reported associations between elements for logic model: The results indicate that the influence of socioeconomic factors may be overstated failing to control for access to specialised care

Stavrou 2009[249] Country: UK Study design: Qualitative Data collection method: Interviews using case study patients Aim: To explore GP accounts of decisions to refer Detail of participants (number, any reported demographics): 14 GPs from inner London boroughs in practices that had counsellors and clinical psychologists. Seven male, seven female; mean age 39 years; mean 11 years in practice. Most working in large practices and with interest in mental health	Methods: Clinical psychologist and counsellor identified the GP's five most recent referrals aged 18–65 and referred for anxiety, depression, panic disorder, obsessive–compulsive disorder and also five comparable cases where GP had decided not to refer. In interview GP asked to describe and compare patients Control: None Length of follow-up: NA Response and/or attrition rate: 47% response rate Context (from what/who to what/who): GP referral of patients with anxiety, depression to psychological therapy or mental health services	Outcome measures: Themes	Main results: Three factors distinguished those referred and not referred Patient's request and interest in referral – no GP refused if patient asked, reassured that patient thought about it and showed motivation, gave a focus to the consultation and saved time Patient's likely benefit – how suitable a candidate, including more motivated and having more insight, psychologically minded, obsessive–compulsive disorder and panic disorder referred as viewed as being treatable. Also those with history of not attending considered not suitable. Those with intractable or chronic problems seen as not benefiting GP's perceived capacity to help – perceived no expertise to help (e.g. childhood abuse, obsessive–compulsive disorder, post-traumatic stress disorder, feeling of needing more than they could offer, not having enough time, whether or not improving with GP treatment and GP confidence in treatment, severity of presentation) Often a combination of these factors, and some GPs placed more emphasis on some factors than another Waiting lists mentioned in consideration whether or not to refer. GPs would prioritise patients they thought would use the referral well and benefit the most	Reported associations between elements for logic model: Views of GP and referral

Steele 2012[203] Country: Canada Study design: Cross-sectional Data collection method: Survey Aim: To examine the referral patterns of remote/rural PCPs Detail of participants (number, any reported demographics): PCPs located in rural/remote areas. $n = 847$. Majority male, aged 41–60	Method: Postal or online survey; rating of frequency of referral often, sometimes, rarely Number of hours: NA Control: None Length of follow-up: NA Response and/or attrition rate: 24.9% Context (from what/who to what/who): Primary care providers to psychiatry	Outcome measures: Factors in referral decisions	Main results: Long wait times most common deterrent to referral Main reasons for referral were to obtain recommendation regarding medication and for assessment of non-responsive patients High confidence in making referrals, lower confidence in managing mental health patients, need for professional development identified	Reported associations between elements for logic model: Referral requested with regard to medication, non-responding patients
Sullivan 2005[285] Country: UK Study design: Retrospective cohort Data collection method: Database analysis Aim: To examine the role of age, sex and morbidity in referral Detail of participants (number, any reported demographics): 202 GP practices with patient total 1,161,892	Method: Data from General Practice Research Database Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GPs to specialist referral	Outcome measures: Percentage of patients referred	Main results: 14% of patients referred to a specialist at least once during study period The percentage of patients referred increased with age and morbidity. 7.5% aged 0–15 years, compared with 21.1% aged under 65 years. Females 17.1% vs. 12.2% males Age and sex explained only 5.3% of variability, morbidity explained 30.4% of the variability (healthy to least healthy) Most variation occurred within practices, with between-practices variation only 5%. Range in patients referred after excluding those with very low referrals was 2.4% to 24% Two-thirds (66.1%) of variation remained unexplained at patient level and 3.6% at the practice level	Reported associations between elements for logic model: Variation in within-practice referral rates, patient characteristics and referral

Swarztrauber 2002[171] Country: USA Study design: Cross-sectional Data collection method: Questionnaire Aim: To determine neurologists' and primary care physicians' preferences for specialist involvement in the management of common neurological conditions and the factors influencing these preferences Detail of participants (number, any reported demographics): 608 family physicians, 624 general internists, and 492 neurologists	Method: A self-administered questionnaire was developed with the assistance of a multispecialty Advisory Board and sent to a stratified probability sample of 608 family physicians, 624 general internists and 492 neurologists The questionnaire contained three clinical scenarios, each followed by questions regarding respondent preferences for the primary care physician to manage alone, curbside or refer to a specialist. The questionnaire also contained knowledge questions corresponding to each scenario and physician and practice characteristics questions Control: NA Length of follow-up: NA Response and/or attrition rate: Response rate was 60% Context (from what/who to what/who): GP to neurology	Outcome measures: Reasons for referral Knowledge	Main results: For all three scenarios, primary care physicians' preferences to involve a specialist differed substantially from neurologists' preferences, with nearly all neurologists preferring involvement of a specialist: transient neurological event (48% and 39% vs. 2%), Parkinson's disease (37% and 38% vs. 3%), and dementia (74% and 59% vs. 2%) Primary care physicians with less knowledge were more likely to prefer assistance from a neurologist Primary care physicians who preferred to manage the patient without specialty involvement had higher knowledge scores than primary care physicians who preferred to curbside or refer to a specialist ($p < 0.001$) Physician age and practice setting influenced the type of assistance preferred (curbside vs. referral) Utilisation management techniques and financial incentives had little influence on physician preferences regarding involving a specialist	Reported associations between elements for logic model: Unclear

Taggarshe 2006[233] Country: UK Study design: Cross-sectional Data collection method: focus group and questionnaire Aim: Assessed GP's referral patterns across a metropolitan health authority, which has actively encouraged generic referrals Detail of participants (number, any reported demographics):	Method: A focus group of GPs was used to determine the factors influencing referral patterns to secondary care for a surgical opinion A questionnaire was devised based on the factors that emerged from the focus group All GPs attending continuing-medical-education sessions across Doncaster Health authority were asked to complete this questionnaire Control: NA Length of follow-up: NA Response and/or attrition rate: 99% response rate Context (from what/who to what/who): GP referrals to specialist (generic referrals)	Outcome measures: GP attitudes/behaviours	Main results: Of the 79 GPs surveyed, 78 completed the questionnaire Of the 78 respondents, only 17 (22%) stated that it was their policy to make generic referrals, and 61 GPs (78%) always made specific named consultant referrals Almost four of five GPs made referrals specifically to a named surgeon. A total of 43% of the GPs who referred to a named surgeon ranked perceived clinical skills/ competence as the most important factor The other factors that influenced their decision in order of importance were waiting times (19%), personal rapport with consultant (12.6%) and feedback from patients (12.6%)	Reported associations between elements for logic model: GPs in the Doncaster area do not make generic referrals. This has to be taken into account in planning service delivery

Thorsen 2012[239] Country: Norway Study design: Qualitative study Data collection method: Semistructured focus group interviews Aim: Identify and describe GPs' reflections on and attitudes to the referral process and co-operation with hospital specialists Detail of participants (number, any reported demographics): 17 female and 14 male GPs aged 29 to 61 years from 21 different practices, who had practised for 3–35 years	Method: Interviews conducted over four months from November 2010 to February 2011 Control: NA Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GP referral to hospital specialists	Outcome measures: Description of GPs' views on the referral process	Main results: GPs wished for improved dialogue with the hospital specialists. The referral process was often considered as asymmetric and sometimes humiliating. GPs saw the benefit of using templates in the referral process, but were sceptical concerning the use of mandatory fixed formats	Reported associations between elements for logic model: Unclear

Todman 2011[295] Country: UK Study design: Cross-sectional Data collection method: Survey Aim: To examine the therapeutic preference of GPs Detail of participants (number, any reported demographics): 119 GPs in one area of Scottish Highlands	Method: Three questions relating to need and current treatment Control: None Length of follow-up: NA Response and/or attrition rate: 46% Context (from what/who to what/who): GP to Older Adult Psychology services	Outcome measures: Type of treatment Perception of efficacy	Main results: GPs reported that a lower waiting times and more localised service would increase the likelihood of a referral being made Many patients with depression or anxiety may not be referred. Social therapeutic options seen as most effective option (mean 5.23 SD 1) followed by pharmacological interventions (mean 4.92 SD 1.1). However, most likely to prescribe pharmacological treatment (84%) rather than social therapy (40%) GPs' low rate of referral of elderly patients	Reported associations between elements for logic model: Need to consider GP preferences for intervention type
Townsley *et al.* 2003[165] Country: Canada Study design: Cross-sectional Data collection method: Postal survey Aim: To understand why older patients may be under-referred Detail of participants (number, any reported demographics): 2089 questionnaires returned from primary care providers throughout Ontario	Method: Questionnaire developed from literature review and Delphi. 21 questions including a clinical scenario. Demographics, attitudes, potential barriers Control: None Length of follow-up: NA Response and/or attrition rate: 24% Context (from what/who to what/who): Primary care providers to oncology	Outcome measures: Referral rate Factors influencing referral decisions	Main results: Factors influencing GPs decision to refer: Patient desire to be referred (69%) Type of cancer (54%) Stage of cancer (49%) Severity of symptoms (49%) Age did not influence referral decision. Barriers cited were length of waiting list, need for tissue diagnosis before referral and belief that oncologists seldom relate to primary care providers Physicians in rural or mixed areas less likely to refer late-stage patients and more likely to consider patient wishes and availability of oncology specialists Physicians with extra training in geriatrics and those in practice longer less likely to refer regardless of tumour stage	Reported associations between elements for logic model: Patient wishes and referral GP additional training and referral

Trude 2003[199] Country: USA Study design: Cross-sectional Data collection method: Telephone survey Aim: To examine how practice setting may impact on referral Detail of participants (number, any reported demographics): 6586 primary care physicians 40% female; 34% less than 10 years qualified; half worked in practice with nine or fewer physicians. 27% acted as gatekeeper for 70% or more of caseload	Methods: Data from the Community Tracking Study Physician Survey Control: None Length of follow-up: NA Response and/or attrition rate: 61% Context (from what/who to what/who): Primary care to mental health services	Outcome measures: Ability to arrange referrals Practice characteristics	Main results: 54% of physicians reported problems obtaining psychiatric hospital admissions, 54% reported difficulty arranging mental health outpatient referrals Physicians who felt that they did not have adequate time with their patients reported problems obtaining mental health services Physicians in solo and small group practices reported having more difficulty obtaining referrals to mental health services	Reported associations between elements for logic model: Problems obtaining referral to mental health

Tucker 2003[198] Country: UK Study design: Cross-sectional Data collection method: Postal survey and telephone interview Aim: To assess the diagnosis and management of mild non-proteinuric hypertension in pregnancy in rural general practices against guideline recommendations Detail of participants (number, any reported demographics): All 174 designated rural general practices in Scotland. 171 GPs and 158 midwives responsible for antenatal care stratified by distance from a specialist maternity hospital	Method: Self-complete questionnaires and one reminder were mailed. The questionnaire contained two scenarios for mild non-proteinuric hypertension taken from the Scottish Obstetric Guidelines and Audit Project on mild non-proteinuric hypertension in pregnancy This national guideline uses the methodology of the Scottish Intercollegiate Guidelines Network and was developed by a multidisciplinary group from university teaching and district general hospitals, as well as by staff from primary/community care settings. Scottish Intercollegiate Guidelines Network guidelines are widely circulated and are sent automatically to all GPs in Scotland. Professionals were asked for their diagnosis and management for scenario 1 and management for scenario 2. Replies were compared with the correct diagnosis and the recommended management according to the guideline Response and/or attrition rate: At least one professional returned a completed questionnaire for 158 (91%) of the 174 practices. The response rates were 68% (117/171) for GPs and 77% (121/158) for midwives Context (from what/who to what/who): GP referral for mild non-proteinuric hypertension in pregnancy	Outcome measures: Accuracy of diagnosis and appropriateness of management compared with guideline	Main results: At least one respondent replied for 91% (158/174) of rural practices. Response rates were 68% (117/170) for GPs and 77% (121/158) for midwives. Both GP and midwife replied for 46% (80/174) of practices. Most GPs (80%, 87/109) and midwives (63%, 71/113) overdiagnosed the scenario. Intended management was, therefore, most often referral or admission to specialist hospital (59%, 132/224), both courses of action beyond guideline recommendations There was an association between distance of practice from specialist maternity hospital and professionals' report of intended referral or admission Explanatory factors from telephone interviews included a poor knowledge base, cautious risk assessment and perceived inflexibility of guidelines for remote situations	Reported associations between elements for logic model: The results suggest that women in rural settings may experience more antenatal referrals and admissions than are clinically appropriate according to the guidelines

Tzaribachev 2009[173] Country: Germany Study design: Retrospective cohort Data collection method: Patient data Aim: To report on referral patterns of primary physicians for children subsequently diagnosed with juvenile idiopathic arthritis and to identify predictors of delayed referral to a paediatric rheumatology centre Detail of participants (number, any reported demographics): A total of 132 patients with juvenile idiopathic arthritis were included; 83 (63%) were female	Method: A retrospective cohort study of consecutive patients with juvenile idiopathic arthritis referred to a paediatric rheumatology centre over a 15-year period was performed. Variables included age, sex, juvenile idiopathic arthritis subtype, the physician's subspecialty and distance to the paediatric rheumatology centre Putative predictors were evaluated by analysis of variance, resulting in regression models Control: NA Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): GP to paediatric rheumatology	Outcome measures: Time to first presentation to a primary physician Time to the first rheumatology visit Total time to referral	Main results: The median age at the onset of symptoms was 4.5 years (range 1.0–15.8 years) Most frequently, children were referred by paediatricians (49.4%) or orthopaedic surgeons (34.1%) The median time to first presentation was short at 10 days (range 0–1610 days). In contrast, the median time to first rheumatology visit was 60 days (range 0.0–100.0 days), resulting in a long median total time to referral of 90 days (range 0.0–160.0 days) Statistically significant predictors for delayed referral were the primary physician's subspecialty ($p = 0.016$) and the distance to the paediatric rheumatology centre ($p < 0.001$) Children living in remote areas or referred by orthopaedic surgeons had the longest referral times	Reported associations between elements for logic model: Despite free access to health care in Germany, children with juvenile idiopathic arthritis are referred to paediatric rheumatology centres with significant delay

Van der Weijden 2002[212] Country: the Netherlands Study design: Qualitative Data collection method: Interviews with GPs Detail of participants (number, any reported demographics): 21 GPs in rural and urban areas	Methods: Qualitative interviews Control: None Length of follow-up: None Response and/or attrition rate: Context (from what/who to what/who): GP to laboratory testing for patients presenting with unexplained complaints	Outcome measures: Reported variables influencing test ordering behaviour	Main results: Variables related to practice and societal aspects and included attitudes, social influences and self-efficacy Practice – time pressures, availability of technology Societal – expense, claims culture, threshold for patient consultation Attitudes – cognition and beliefs of GP Social influences – social norms, pressure, support, modelling Self-efficacy – GPs' expectation regarding capability to perform desired behaviour Cognitions – older patient, alarming symptoms Misconceptions – value of tests Uncertainty – handling uncertainty, error tolerance Wish to comfort patients Social influences from the patient – assertive, worried, relationship with patient, need for reassurance Social influences from the profession – influence of specialist, test ordering behaviour Perceived capability/skills – diagnostic capability, skills of patient negotiation, ability to reassure oneself, ability in history taking Other factors – routines, GP condition (e.g. tiredness, tactical motives for testing)	Reported associations between elements for logic model: Determinants of test ordering are numerous with both medical and non-medical motives GPs order tests for many purposes. How these factors interact remains an individual-GP matter

Vinker 2007[269] Country: Israel Study design: Cross-sectional Data collection method: Patient questionnaire and examination of referral letters Aim: To examine the characteristics of urgent referrals Detail of participants (number, any reported demographics): 257 referrals	Methods: Cross-sectional analysis of patient data Control: None Length of follow-up: NA Response and/or attrition rate: Context (from what/who to what/who): Referral to ophthalmology, orthopaedics, ENT or dermatology	Outcome measures: Characteristics of referral Judgement of urgency	Main results: Length of time patient with GP did not affect referral Reasons given by patients for referral – the FP did not know how to treat the problem (44%); the FP wanted a second opinion (23%); patient request (20%); and treatment did not help (10%) Urgent referrals tended to be younger. Patients given urgent referrals perceived their GP to be more available. Most referrals to ophthalmology were urgent No significant patient gender difference whether referrals classed as urgent or non-urgent Low agreement between peer observers and referrer regarding whether an urgent referral should be classed as urgent. Observers viewed as urgent only 20.7% of urgent referrals. Disparity between consultants regarding classification and referrer (consultants thought that only 48.7% of urgent referral were urgent)	Reported associations between elements for logic model: Patient views regarding reasons for referral Patient gender not a predictor of urgency of referral

Vulto *et al.* 2009[250] Country: the Netherlands Study design: Cross-sectional Data collection method: Survey Aim: To examine GP knowledge of palliative radiotherapy Detail of participants (number, any reported demographics): 489 GPs south Netherlands; 65% male; 50% health centre practice; 75% full-time; 56% 30–60 minutes to radiotherapy department	Methods: Questionnaire Control: None Length of follow-up: NA Response and/or attrition rate: 45.5% Context (from what/who to what/who): GP to palliative radiotherapy	Outcome measures: Self-reported knowledge Referral rate	Main results: 40% of respondents assessed their knowledge of palliative radiotherapy as modest. Time since graduation did not seem to affect knowledge Patient-related factors such as discomfort and poor condition but not age were reported to influence referral. Most GPs reported they reacted to the wish of the patient regarding referral	Reported associations between elements for logic model: Knowledge and referral, patient wishes and referral

Wakefield 2012[227] Country: Canada Study design: Cross-sectional Data collection method: Survey of family physicians Detail of participants (number, any reported demographics): 91 family physicians	Methods: Cross-sectional survey Control: None Length of follow-up: None Response and/or attrition rate: 91 of 458 physicians responded (19.9%) Context (from what/who to what/who): Family physician to cardiology	Outcome measures: Likert scales Data on referrals	Main results: No difference in reported referral criteria used by physicians by gender, age or length of time in practice Analysis of physician referral considerations – scale 1 = unimportant, 5 = important Fast access 4.77; test results available quickly 4.69; notification to GP of test date 4.65; reports concise 4.59; confidence in physician to address problem 4.59; previous experience with facility 4.37; short distance to travel 4.25; option to consult with specialist 4.25; knowledge of physicians at the facility 4.23; location of facility 3.84; patient requests destination 3.65; 2.99 language barrier issues; 2.66 have privileges at that institution; patient in otherwise good health 2.32; patient age 2.26; patient gender 1.95 Factor analysis – factor of physician communication expectation explained 23.4% of variance; patient characteristics explained 16.1% of variance; physician access 10.6%; geographic location 8.2%; patient convenience 7.3%. Variance accounted for by these factors was 65.6%	Reported associations between elements for logic model: Physicians choose referral destination based on a range of factors with good communication from specialist service to GP and speed of access for patient of key importance

Walders 2003[300] Country: USA Study design: Survey Data collection method: Aim: To examine the frequency of barriers to mental health referral according to paediatric primary care physician report and to identify factors related to perceptions of referral barriers for patients with managed care coverage Detail of participants (number, any reported demographics): Data from a national sample of 319 PCPs were examined	Method: Data from a national sample of 319 primary care physicians were examined. Comparisons were made concerning the frequency of primary care physician-reported barriers to mental health referrals for patients with fee-for-service vs. managed care coverage. The relationship between relevant factors (e.g. practice structure, interdisciplinary office staff, availability of community mental health resources) and perceived barriers was examined for managed care coverage Control: None Length of follow-up: none Response and/or attrition rate: A total of 539 clinicians agreed to participate and 431 clinicians returned the study measures, reflecting an 80% response rate Context (from what/who to what/who): Paediatric primary care referrals for mental health	Outcome measures: Barriers to referral	Main results: Barriers to mental health referrals were more commonly reported for those with managed care vs. fee-for-service coverage for 11 of the 12 barriers assessed ($p < 0.001$) For patients with managed care coverage a high availability of community mental health resources was associated with fewer perceived barriers among physicians ($p < 0.001$)	Reported associations between elements for logic model: Referral barriers were more commonly reported for patients with managed care coverage

Wassenaar 2007[178] Country: USA Study design: Cross-sectional Data collection method: Postal survey with case scenarios Aim: To examine whether or not referral patterns for lung cancer differed from breast cancer Detail of participants (number, any reported demographics): 672 physicians in Wisconsin	Methods: Postal survey with case scenarios Control: None Length of follow-up: NA Response and/or attrition rate: 59.4% Context (from what/who to what/who): PCPs to oncology	Outcome measures: Likelihood of referral	Main results: GPs reported that type of cancer was not a factor in their referral decisions; however, metastatic breast cancer patients were likely to be referred for further therapy whereas metastatic lung cancer patients were likely to be referred to symptom management only Patient smoking or non-smoking not a factor in referral decision No difference in referral patterns related to those who had more or fewer patients with cancer in their practice; age of physician not associated with referral pattern; no difference associated with physician gender More physicians knew chemotherapy improved survival in advance breast cancer than in advanced lung cancer	Reported associations between elements for logic model: Physician demographics not associated with referral decisions Differing knowledge levels different types of disease and referral

Watson 2001[195] Country: UK Study design: Cross-sectional Data collection method: Questionnaire (quantitative) Aim: The aim of the study was to investigate the appropriateness of primary care referrals to the Oxford Regional Genetics Service on account of family history of breast and/or ovarian cancer and to explore GPs' expectations following a referral Detail of participants (number, any reported demographics): $n = 50$ consecutive referring GPs	Method: 50 consecutive GPs were sent a questionnaire post referral, and their referral letters were reviewed Response and/or attrition rate: 94% response rate Context (from what/who to what/who): GPs to Oxford Regional Genetics Service	Outcome measures: Appropriate referral	Main results: Many GPs did not know which patients warranted referral to the genetics service and had unrealistic expectations of what happened at the clinic 41 GP referral letters were available in the clinic notes for assessment of whether the referral met the locally agreed guideline criteria. 46% (19/41) of the letters met the referral criteria (i.e. reported family history suggestive of moderate/high risk), 29% (12/41) did not meet the criteria, and in 24% (10/41) of cases there was insufficient information in the letter to know whether or not the criteria had been met. 53% (8/15) of referrals where the GP reported using guidelines met the referral criteria, compared with 42% (11/26) where guidelines were not reported ($\chi^2 = 0.465$, $p = 0.495$). In the nine referrals which raised the issue of family history, only 1/3 (3/9) actually met the referral criteria	Reported associations between elements for logic model: GP education in the proper use of referral guidelines is required

Wilkes *et al.* 2009[213] Country: UK Study design: Qualitative Data collection method: Interviews Aim: To explore perceptions and attitudes of patients and professionals to open-access hysterosalpingography screening Detail of participants (number, any reported demographics): 12 GPs, five fertility specialists, 13 infertile couples	Methods: Qualitative interviews Convenience sample Control: None Length of follow-up: NA Response and/or attrition rate: NR Context (from what/who to what/who): GP referral for infertility hysterosalpingography (an investigation of infertile women not usually available to GPs)	Outcome measures: Views and perceptions	Main results: Three GPs had access and used it, six had access and did not use it and three did not have access. Five couples had not experienced it, eight had experienced open-access testing Most GPs felt that open-access testing would speed up the investigation process but felt uncomfortable organising it Main barriers – infrequent exposure to infertile couples leading to lack of skills, lack of confidence and low priority. GPs felt it would create more work, although minimal. View that GPs may lack interest and therefore prefer to refer directly Suggestion that it should be managed by one GP in a practice on behalf of a group Half of GPs felt that it should be in their remit and that they had the expertise. Concerned regarding pressure on time, having expertise and keeping skills up to date. Minority felt that it should be a GPwSI, majority thought that it would fall within remit of GP with an informal interest	Reported associations between elements for logic model: GP expertise, knowledge and open-access investigation Satisfaction with model Perceived benefits of open-access testing

Specialists reported benefit from the investigation being done by the GP – enabled diagnosis and management to be made at first appointment. Some concern about inappropriate use by GPs but 'rationalised with access to HSG being criteria driven'. Specialists felt that it was appropriate for GP to perform the test	
Patients positive as it 'got the ball rolling', speeded up access to specialists. Majority felt that it was/should be within the GP remit; minority preferred direct referral	
Most participants felt that access to the test would direct referrals more appropriately with decreased commissioning costs through a decrease in unnecessary or wrongly directed referrals	
Guidelines seen as enabling practitioners to work effectively and offered some indemnity	
All GPs, specialists and patients who had experienced the service wished it to remain in place, including some who had not experienced it. Not all GPs were keen to have access to it personally	

Xu 2002[235] Country: USA Study design: Cross-sectional Data collection method: Database analysis Aim: To examine physician and practice characteristics associated with perceived ability to refer Detail of participants (number, any reported demographics): 2572 PCPs in solo/two physician practices and 1820 in group practices. 79% male specialty in internal medicine, family/general practice (49%), paediatrics, medical specialties	Methods: Data from the Community Tracking Study Physician Survey, multivariate analysis Control: None Length of follow-up: NA Response and/or attrition rate: The Community Tracking Survey had a response rate of 65% Context (from what/who to what/who): Primary care referral to specialist in case of 'medical necessity'	Outcome measures: Perception of ability to refer – physician, practice and financial characteristics	Main results: The perceived ability to refer did not differ by practice size Physician experience and the effect of formal written guidelines were influential in smaller practices but not in group practices The effect of financial arrangements was more significant for physicians in solo/two-physician practices The most significant determiner of perceived ability to refer was PCP physician satisfaction in their communication with specialists	Reported associations between elements for logic model: Financial arrangements regarding referral impacted more on perceived ability to refer in smaller practices

Young 2010[221] Country: Australia Study design: Qualitative Data collection method: Interviews with GPs Detail of participants (number, any reported demographics): 10 GPs	Methods: Qualitative interviews Control: None Length of follow-up: None Response and/or attrition rate: Context (from what/who to what/who): GP to consumer health organisations	Outcome measures: Views and perceptions	Main results: Processes of referral were influenced considerably by the degree to which GPs had taken on a broader chronic care models rather than a more traditional care approach GPs orientated towards traditional care models stated that they did not refer patients who they perceived to be unmotivated GPs reflected on decisions to refer based on severity and stage of the disease – those with more severe or life-altering conditions were referred more frequently (e.g. diabetes more than conditions such as asthma which were not seen to be as 'complicated illness') Difference between GPs in terms of when to refer – newly diagnosed or later so as not to overwhelm GP concern that consumer health organisation may be negative or dominated by people with a viewpoint that was not right for the patient Referral to consumer health organisation viewed as easy/quick	Reported associations between elements for logic model: Self-perceived role of GP and referral Variation in timing of referral

Zielinski 2008[166] Country: Lithuania Study design: Cross-sectional Data collection method: Analysis of patient records Aim: To investigate whether or not different models of health care impact on referral patterns Detail of participants (number, any reported demographics): 18 PHC practices in one region, serving 250,070 inhabitants. 70% listed with public polyclinics; one-fifth of population listed with family medicine practices (public or private). Four different models operated – rural state-owned, family medicine practices, urban privately owned practices, state owned polyclinics and privately owned polyclinics (both mostly urban)	Methods: Data from state sickness fund database Control: None Length of follow-up: NA Response and/or attrition rate: NA Context (from what/who to what/who): Different models of primary care and referral to specialised care	Outcome measures: Patient demographics Practice characteristics Referrals	Main results: Family medicine practices located in rural areas had lower referral rates than other three models Referral rates were higher for female patients. Highest rate of referral was in age 60–79 years. Age and gender, though, had only minor effects Patient place of residence (rural/urban) and comorbidity level were the most important factors influencing referral rate. Those with higher comorbidity were more likely to be referred Patient characteristics explained about 40% of variability; facility characteristics and whether or not a family physician explain about 10% Referral rates were higher from public and private polyclinics, which have easier access to specialists than from public practices Referral rates were higher from private practices than public practices or public polyclinics Being a specialist in family medicine, training and experience correlated with lower referral rates	Reported associations between elements for logic model: Location of practice and referral rate Patient demographics and comorbidity and referral

AHP, Allied Health Professional; AOR, adjusted odds ratio; I, intervention type; NA, not applicable; PCP, primary care provider; S, specialty referred to.

Appendix 2 Study appraisal tools and assessments

Quality appraisal: intervention studies

Potential risk of bias	Bias present?
1. Selection bias: Method used to generate the allocation sequence, method used to conceal the allocation sequence (where applicable), characteristics of participant group(s)	Yes/no/unclear
2. Performance bias: Measures used to blind participants and personnel and outcome assessors (where applicable), presence of other potential threats to validity	Yes/no/unclear
3. Attrition bias: Incomplete outcome data, high level of withdrawals from the study	Yes/no/unclear
4. Detection bias: Accuracy of measurement of outcomes, length of follow-up	Yes/no/unclear
5. Reporting bias: Selective reporting, accuracy of reporting	Yes/no/unclear

Table of intervention studies

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Adams 2012[33]	N	N	Y	N	N	Lower	132 of 271 participants (48.7%) response
Akbari 2012[110]	N	N	N	N	N	Lower	
Albertson 2002[158]	N	N	N	N	N	Lower	
Banait 2003[53]	N	N	N	N	N	Lower	
Bennett 2001[30]	N	N	N	N	N	Lower	
Bhalla 2002[37]	N	N	N	N	N	Lower	
Bridgman 2005[70]	N	N	N	N	N	Lower	
Callaway 2000[121]	N	N	N	N	Y	Lower	Only single % results reported
Campbell 2003[131]	N	N	N	N	N	Lower	
Chen 2010[100]	N	N	N	N	Y	Lower	Only narrative results reported
Cooper 2012[19]	Y	N	N	Y	Y	Unclear	Details of participants unclear Only single % results reported
Cox 2013[156]	N	N	N	N	N	Lower	
Cusack 2005[43]	N	N	N	N	N	Lower	
DAMASK trial team 2008[76]	N	N	N	N	N	Lower	
Dennison 2006[99]	N	N	N	N	Y	Lower	Only single % results reported
Dey 2004[66]	N	N	N	N	N	Lower	
Dhillon 2003[82]	N	N	Y	N	N	Lower	Attrition rate not reported
Donohoe 2000[31]	N	N	N	N	N	Lower	
Eccles 2001[54]	N	N	N	N	N	Lower	
Eley 2010[83]	N	N	N	N	Y	Lower	Number results only, no statistical analysis
Ellard 2012[38]	N	N	Y	N	N	Lower	Attrition rate not reported

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Elwyn 2007[55]	N	N	N	N	N	Lower	
Emery 2007[111]	N	N	N	N	N	Lower	
Eminovic 2009[86]	N	N	N	N	N	Lower	
Emmerson 2003[40]	N	N	N	N	Y	Lower	Only single % results reported
Engers 2005[67]	N	N	Y	N	N	Lower	Attrition rate/length of follow-up not reported
Evans 2009[21]	N	N	N	N	N	Lower	
Evans 2011[22]	N	N	N	N	N	Lower	
Fearn 2009[48]	Y	N	N	N	N	Lower	Patient characteristics not reported
Felker 2004[132]	N	N	N	N	N	Lower	
Ferris 2002[146]	N	N	Y	N	N	Lower	Attrition rate not reported
Ferris 2001[145]	N	N	Y	N	N	Lower	Attrition rate not reported
Ferriter 2006[157]	N	N	N	N	N	Lower	
Gandhi 2008[108]	N	N	N	N	N	Lower	
Glaves 2005[57]	N	N	N	N	N	Lower	
Gough-Palmer 2009[84]	N	N	N	N	Y	Lower	Only single % results reported
Greiver 2005[114]	N	N	N	N	N	Lower	
Griffiths 2006[58]	N	N	N	N	N	Lower	
Gurden 2012[133]	N	N	N	N	Y	Lower	Only single % results reported
Hands 2001[34]	N	N	N	N	N	Lower	
Harrington 2001[93]	N	N	N	N	Y	Lower	Only single % results reported
Heaney 2001[159]	N	N	N	N	N	Lower	
Hemingway 2006[73]	N	N	N	N	Y	Lower	Intervention period not clear; reported by year rather than before and after
Hermush 2009[137]	N	N	N	N	N	Lower	

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Hill 2000[49]	N	N	N	N	Y	Lower	Only single % results reported
Hilty 2006[24]	N	N	N	N	N	Lower	
Hockey 2004[91]	Y	N	N	Y	Y	Higher	No participant details. Only narrative results reported. Intervention problems
Hughes-Anderson 2002[136]	N	N	N	N	N	Lower	
Idiculla 2000[44]	N	N	N	N	Y	Lower	Only narrative results reported (few percentages)
Imkampe 2006[47]	N	N	N	N	N	Lower	
Iversen 2000[151]	N	N	Y	N	Y	Higher	Only single % results reported. Only 37% of GPs provided data
Jaatinen 2002[95]	N	N	N	N	N	Lower	
Jiwa 2004[23]	N	N	N	N	N	Lower	
Jiwa 2006[68]	N	N	N	N	N	Lower	
Jiwa 2012[105]	N	N	N	N	N	Lower	
Johnson 2008a[139]	N	N	N	N	Y	Lower	Only narrative results reported
Joyce 2000[147]	N	N	N	N	Y	Lower	Only narrative results reported
Julian 2007[62]	N	N	N	N	N	Lower	
Junghans 2007[109]	N	N	N	N	N	Lower	
Kennedy 2012[106]	N	N	N	N	Y	Lower	Only single % results reported
Kerry 2000[59]	N	N	N	N	N	Lower	
Khan 2008[71]	N	N	N	N	Y	Lower	Only single % results reported
Kim 2004[155]	N	N	N	N	Y	Lower	Only narrative results reported
Kim 2009[98]	N	N	N	N	N	Lower	
Kim-Hwang 2010[102]	N	N	N	N	N	Lower	
King 2001[119]	N	N	N	N	N	Lower	

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Knab 2001[112]	N	N	N	N	N	Lower	
Knol 2006[90]	N	N	N	Y	Y	Higher	Reports both 53% and 51% reduction. Poor categorisation
Kousgaard 2003[29]	N	N	N	N	N	Lower	
Lam 2011[25]	N	N	Y	N	Y	Higher	52.4% response rate. Only narrative results reported. Weak outcome measure
Leggett 2004[85]	N	N	N	N	N	Lower	
Leiba 2002[130]	N	N	N	N	N	Lower	
Lester 2009[39]	N	N	Y	N	N	Lower	Attrition rate not reported
Levell 2012[129]	Y	N	Y	N	N	Higher	Patient characteristics not reported. Attrition rate not reported. Descriptive
Lucassen 2001[45]	N	N	Y	N	N	Lower	Attrition rate not reported
Lyon 2009[160]	N	N	Y	N	N	Lower	
Maddison 2004[154]	Y	N	N	Y	Y	Higher	Patient characteristics not reported Only single % results reported
Magill 2009[115]	N	N	N	N	N	Lower	
Malik 2007[41]	Y	N	N	Y	Y	Unclear	Patient characteristics not reported Only single % results reported
Mariotti 2008[113]	N	N	N	N	N	Lower	
Matowe 2002[50]	N	N	N	N	N	Lower	
McGarry 2009[148]	N	N	Y	N	N	Lower	33% response rate
McGowan 2008[107]	N	N	N	N	N	Lower	
McKoy 2004[89]	N	N	N	N	Y	Lower	Only single % results reported
McNally 2003[74]	N	N	N	N	N	Lower	

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Melia 2008[51]	N	N	N	N	N	Lower	
Morrison 2001[64]	N	N	N	N	N	Lower	
Nicholson 2006[97]	Y	N	N	Y	N	Higher	Very small sample, survey not piloted, questions strongly leading to the positive
Nielsen 2003[92]	N	N	N	N	N	Lower	
Patterson 2004[104]	N	N	N	N	Y	Lower	Only narrative results reported
Pfeiffer 2011[138]	N	N	N	N	N	Lower	
Potter 2007[46]	N	N	N	N	N	Lower	
Prades 2011[75]	N	N	N	Y	Y	Lower	
Ramsay 2003[27]	N	N	N	N	N	Lower	
Ridsdale 2008[124]	N	N	N	N	N	Lower	
Robling 2002[60]	N	N	N	N	N	Lower	
Rosen 2006[128]	N	N	N	N	N	Lower	
Rowlands 2003[26]	Y	N	N	Y	N	Higher	Low recruitment. Tool leading and not tested
Salisbury 2005[125]	N	N	N	N	N	Lower	
Sanderson 2002[126]	N	N	N	N	N	Lower	
Sauro 2005[127]	Y	N	N	N	N	Lower	Not clear if allocation was random
Schillinger 2000[144]	N	N	Y	N	N	Lower	Attrition rate not reported
Schulpen 2003[134]	N	N	Y	N	N	Lower	Attrition rate not reported
Shariff 2010[28]	Y	N	N	N	N	Lower	Patient characteristics not reported
Shaw 2006[77]	N	N	N	N	N	Lower	
Simpson 2003[143]	Y	N	N	N	Y	Higher	No participant details. Only narrative results reported. Weak outcome measures
Simpson 2010[78]	N	N	Y	N	N	Lower	23% return rate for GP questionnaires. Weak outcome measures

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Slade 2008[117]	N	N	N	N	N	Lower	
Spatafora 2005[69]	N	N	N	N	N	Lower	
Stainkey 2010[118]	N	N	N	N	Y	Lower	Only single % results reported
Standing 2001[122]	N	N	N	N	Y	Lower	Only single % results reported
Stoves 2010[103]	N	N	N	N	N	Lower	
Suris 2007[35]	N	N	N	N	N	Lower	
Sved-Williams 2010[72]	N	N	Y	Y	N	Higher	26% of GPs responded to survey. Weak outcome measures
Tadros 2009[96]	N	N	N	N	Y	Lower	Only single % results reported
Tan 2007[140]	Y	N	N	Y	Y	Higher	Patient characteristics not reported Data presented in chart form only
Thomas 2003[79]	N	N	N	N	Y	Lower	Only single % results reported
Thomas 2010[80]	N	N	N	N	N	Lower	
Tierney 2003[116]	N	N	N	N	N	Lower	
Twomey 2003[42]	Y	N	N	N	Y	Higher	Patient characteristics not reported Only single % results reported
van Bokhoven 2012[120]	N	N	N	N	N	Lower	
Van Dijk 2013[149]	N	N	N	N	Y	Lower	Only narrative results reported
Van Dijk 2010[141]	N	N	N	N	N	Lower	
Van Dijk 2011[123]	N	N	N	N	N	Lower	
Vardy 2008[150]	N	N	N	N	Y	Lower	Only single % results reported
Vlek 2003[135]	N	N	N	N	N	Lower	
Walkowski 2007[63]	N	N	N	N	Y	Lower	Only single % results reported
Wallace 2004[94]	N	N	N	N	N	Lower	

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Watson 2001[32]	N	N	N	N	N	Lower	
Watson 2002[152]	N	N	N	N	Y	Lower	Only single % results reported
West 2007[52]	Y	N	N	N	N	Lower	Patient characteristics not reported
White 2000[142]	Y	N	N	N	N	Lower	Patient characteristics not reported
White 2004[61]	N	N	N	N	Y	Lower	Only narrative results reported
Whited 2002[87]	N	N	N	N	N	Lower	
Whited 2004[88]	N	N	N	N	N	Lower	
Whiting 2011[153]	Y	N	N	Y	Y	Higher	Patient characteristics not reported. Study design unclear. Only single % results
Wilson 2006[65]	N	N	N	N	N	Lower	
Wolters 2005[36]	N	N	N	N	N	Lower	
Wong 2000[81]	N	N	N	N	N	Lower	
Wright 2006[56]	N	N	N	N	N	Lower	
Wylie 2001[18]	N	N	N	N	Y	Lower	Only narrative results reported

N, no; Y, yes.

Quality appraisal: quantitative studies

Potential risk of bias	Bias present?
1. *Selection bias:* Method used to generate the allocation sequence, method used to conceal the allocation sequence (where applicable), characteristics of participant group(s)	Yes/no/unclear
2. *Performance bias:* Measures used to blind participants and personnel and outcome assessors (where applicable), presence of other potential threats to validity	Yes/no/unclear
3. *Attrition bias:* Incomplete outcome data, high level of withdrawals from the study	Yes/no/unclear
4. *Detection bias:* Accuracy of measurement of outcomes, length of follow-up	Yes/no/unclear
5. *Reporting bias:* Selective reporting, accuracy of reporting	Yes/no/unclear

Table of quantitative studies

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Ache 2011[277]	Y	N	N	Y	N	Higher	Practitioners working only in Mayo clinics; low number of African American participants; some questions leading
Ahluwalia 2009[214]	Y	N	N	Y	N	Higher	Two Kaiser Permanente hospitals; administered to those who attended a meeting. Asked to recall practice during previous year
Albertson 2000[270]	Y	N	N	N	Y	Lower	Conclusions need to more strongly highlight the very small sample of PCPs (12) compared with 856 patients. Single clinic in an academic medical centre
Alexander 2008[308]	Y	N	Y	N	N	Higher	26% survey response from one rural region
Angstman 2009[184]	Y	N	N	Y	N	Higher	Survey tool not piloted; physicians in a single clinic
Anthony 2010[208]	Y	N	N	Y	N	Higher	One area; snowball sampling; depression care questionnaire not tested; participants asked to recollect practice over previous year. Mixed methods include qualitative data
Ashworth 2002[303]	Y	N	N	N	N	Lower	Practices in one area of London
Balduf 2008[274]	N	N	N	N	N	Lower	
Barnett 2011[222]	Y	N	N	N	N	Lower	Sample clinicians who were members of a particular organisation
Bederman 2010[196]	N	N	Y	N	N	Lower	FP response rate 12%
Bekkelund 2001[259]	N	N	N	N	N	Lower	
Belgamwar 2011[197]	Y	N	Y	N	N	Lower	Referrals to a single centre
Berendsen 2010[262]	N	N	N	N	N	Lower	
Bertakis 2001[264]	Y	N	Y	N	N	Lower	Referrals to a single centre
Blundell 2011[189]	N	N	N	N	N	Lower	Response rate 40%
Bolanos-Carmona 2002[276]	Y	N	N	N	N	Lower	Convenience sample

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Boulware 2006[304]	N	N	Y	N	N	Lower	28% response rate
Bowling 2000[291]	N	N	N	N	N	Lower	
Burns 2002[301]	N	N	N	N	N	Lower	
Carlsen 2008[244]	Y	N	N	Y	N	Higher	GPs from one municipality; GPs distributed questionnaire to their patients; GP self-report number of referrals
Chan *et al.* 2003[275]	N	N	N	N	N	Lower	
Chauhan *et al.* 2012[284]	Y	N	N	N	N	Lower	Data from two PCTs
Chen *et al.* 2005[286]	Y	N	N	N	N	Lower	Nine clinics run by one provider
Chung *et al.* 2010[305]	N	N	N	N	N	Lower	
Clarke *et al.* 2010[190]	Y	N	Y	Unsure	N	Higher	GP response rate 13%; survey not piloted? Scenario development process unclear; compares findings of a guideline development group to the survey
Cohen 2013[267]	N	N	N	N	N	Lower	
Cooper 2001[279]	Y	N	N	N	N	Lower	Case notes from clinic in two hospitals
Coulston 2008[187]	N	N	N	N	Y	Lower	Limited analysis
Coyle 2011[280]	Y	N	N	N	N	Lower	Small sample of GPs from one county
Dale 2000[224]	Y	N	N	Y	Y	Higher	Small sample size of GPs referring to one centre. Methods unclear (e.g. 'postal interview'). Table of demographics but limited other data
Dearman 2006[265]	N	N	N	N	N	Lower	
Delva 2011[161]	N	N	Y	N	N	Lower	30% response rate
Dodds 2004[174]	Y	N	N	N	N	Lower	Data from single PCT
Elhayany 2000[167]	Y	N	N	N	N	Lower	Data from one district
Feeney 2007[282]	Y	N	N	N	N	Lower	Referrals to a single centre
Forrest 2007[246]	N	N	N	N	N	Lower	

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Forrest 2002[223]	N	N	N	N	N	Lower	
Forrest 2003[219]	N	N	N	N	N	Lower	
Forrest 2006[283]	N	N	N	N	N	Lower	
Franks 2000[216]	Y	N	N	N	N	Lower	One managed care organisation. Ceiling effect on some measured items
Franz 2010[307]	Y	N	N	N	N	Lower	
Freed 2003[172]	Y	N	N	N	N	Lower	Low response from family physicians
Fucito 2003[162]	Y	N	N	Y	N	Higher	GPs in Sydney; survey and vignette not piloted; self-reported knowledge/skills
Gandhi 2000[101]	Y	N	N	N	N	Lower	Data from single academic tertiary care medical centre
Glozier 2007[254]	Y	N	N	N	N	Lower	Referrals to clinic in one trust
Grace 2008[292]	N	N	Y	N	N	Lower	Low response rate
Green 2008[220]	N	N	N	Y	N	Lower	Vignette not piloted
Greer 2011[240]	N	N	Y	N	N	Lower	Case scenarios not piloted
Gross 2000[261]	N	N	N	N	N	Lower	
Gruen 2002[281]	N	N	N	N	N	Lower	
Guevara 2009[290]	N	N	N	N	N	Lower	
Harlan 2009[231]	Y	N	N	N	N	Lower	Data from small area; telephone interviews
Harris 2011[268]	Y	N	N	N	N	Lower	Practices in Sydney area
Harvey 2005[242]	Y	N	N	N	N	Lower	Physicians in a single city
Hugo 2000[272]	Y	N	N	N	N	Lower	Data from a single clinic, although referrers from wider area
Hyman 2001[248]	N	N	N	Y	N	Lower	Limited reporting

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Jiwa 2008[193]	N	N	N	N	N	Lower	
Jiwa 2009[241]	Y	N	N	N	N	Lower	Little detail of the specialists rating the letters apart from that they offered to take part
Johnson 2008[271]	N	N	Y	Y	Y	Higher	Response rate 13%; no examination of non-responders. Description of development of tool but not piloted; significant use of 'unsure' category. Use of descriptive stats; possible overstatement of findings
Johnson 2011[245]	N	N	N	N	N	Lower	40% response
Johnson 2011[289]	N	N	Y	N	N	Lower	31% response rate, only location comparison made between responders and non responders
Jorgensen 2001[181]	N	N	N	N	N	Lower	
Kasje 2004[191]	Y	N	N	N	N	Lower	Single area, north Netherlands
Kier 2012[294]	Y	N	N	N	N	Lower	Selection process of GPs contacted not clear; no details of questions asked
Kim 2009[98]	Y	N	N	N	N	Lower	Referrals to one hospital; web-based survey
Kinchen 2004[238]	N	N	N	N	N	Lower	
Kisely 2002[185]	Y	N	N	Y	N	Higher	This study is a partial evaluation of an intervention; however, it is predominantly a survey of practitioners. Survey tool not tested; self-reported knowledge levels
Kvaerner 2007[168]	N	N	N	Y	N	Lower	GPs asked to retrospectively estimate referrals
Lakha 2011[179]	Y	N	N	N	N	Lower	Data from a single clinic. Low response rate but assessed any difference between responders and non-responders
Lambert 2001[175]	Y	N	N	N	N	Lower	Data from single city
Lewis 2000[260]	Y	N	N	N	N	Lower	Authors highlight potential selection bias
Little 2004[251]	N	N	N	N	N	Lower	Practices around one city; however, compared with national data
Love 2005[302]	N	N	N	N	N	Lower	

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Malcolm 2008[299]	Y	N	N	N	N	Lower	Clinics in one city; 39% response rate
Massey 2004[236]	Y	N	N	Y	N	Higher	Questionnaire tool has weaknesses in wording and method for design of tool not reported; sample size small; limited detail of recruitment
McBride 2010[287]	N	N	N	N	N	Lower	
McKenna 2005[225]	N	N	N	Y	N	Lower	Survey and vignettes not piloted; self-reported knowledge levels
Mitchell 2012[186]	Y	N	Y	N	N	Higher	Mixed methods, but few qualitative data. Low response rate; dietitians in private practice
Montgomery 2006[180]	N	N	N	Y	N	Lower	Case scenarios not piloted
Moore 2000[205]	Y	N	Y	Y	Y	Higher	PCPs in one state; 11.6% response rate; self-reported estimate referral rate; some questions leading; findings overstated?
Morsi 2012[200]	Y	N	N	N	N	Lower	Three hospitals in one area
Mulvaney 2005[297]	N	N	N	N	N	Lower	
Musila 2011[255]	Y	N	N	Y	N	Higher	Work carried out by members of a guideline development group; case scenarios developed from discussion and not tested prior to use
Naccarella 2008[169]	Y	N	N	N	N	Lower	Survey of project officers taking part in a project
Navaneethan 2010[278]	Y	N	N	N	N	Lower	25% survey response; physicians from a single area
O'Byrne 2010[243]	N	N	N	N	N	Lower	
Sullivan 2005[285]	N	N	N	Y	N	Lower	GPs entered own coded data
O'Neill 2005[170]	N	N	N	Unclear	N	Lower	Level of testing of clinical vignettes unclear (some excluded from the analysis)
Olson 2012[206]	N	N	Y	N	N	Lower	33% response rate; no examination of non-responders
Pfeiffer 2011[138]	Y	N	N	N	N	Lower	Veterans Health Administration facilities only
Philichi 2010[202]	Y	N	Y	Y	N	Higher	Convenience sample sent survey, 38% response rate; survey not piloted

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Pryor 2001[215]	Y	N	N	N	N	Lower	Purposive sampling to increase response rate
Ramanathan 2011[188]	N	N	N	Y	N	Lower	Case vignettes not tested
Ramchandani 2002[247]	Y	N	N	N	N	Lower	Data from single city
Ridsdale 2007[266]	N	N	N	N	N	Lower	
Ringard 2010[164]	N	N	N	N	N	Lower	
Robinson 2010[288]	Y	N	N	N	N	Lower	Referrals to a single service
Rosemann 2005[211]	Y	N	N	N	N	Lower	GPs selected from single rural region
Rushton 2002[183]	N	N	N	N	N	Lower	
Samant 2007[234]	N	N	N	Y	N	Lower	Survey tool not tested prior to use
Scheerers 2007	Y	N	N	N	N	Lower	Referrers to a single centre
Shadd 2011[263]	Y	N	N	N	N	Lower	PCPs in one state
Soerensen 2009[298]	N	N	N	N	N	Lower	
Steele 2012[203]	N	N	Y	Y	Y	Higher	Response rate 24.9%; no examination of non-responders. Tool described as exploratory, not piloted. Descriptive rather than statistical reporting of findings
Swarztrauber 2002[171]	N	N	N	Unclear	N	Lower	Survey piloted but unsure development and testing of scenarios
Taggarshe 2006[233]	Y	N	N	N	Unsure	Higher	Survey distributed only to those attending a meeting. Very little detail regarding findings
Todman 2011[295]	Y	N	N	Y	N	Higher	Single area; limited pilot testing; self-reported retrospective number of referrals
Townsley 2003[165]	Y	N	Y	N	N	Higher	Physicians in one state; low response rate
Trude 2003[199]	N	N	N	N	N	Lower	
Tucker 2003[198]	N	N	N	N	N	Lower	Mixed method study; rural practices across Scotland; rural key area of investigation in study, however
Tzaribachev 2009[173]	Y	N	N	N	N	Lower	Patients referred to a single centre

First author and date	1. Selection bias, Y/N	2. Performance bias, Y/N	3. Attrition bias, Y/N	4. Detection bias, Y/N	5. Reporting bias, Y/N	6. Higher risk/lower risk/unclear	Details of concerns
Vinker 2007[269]	Y	N	N	N	N	Lower	Data relates to a single community clinic
Vulto 2009[250]	N	N	N	Y	N	Lower	Self-reported GP knowledge levels
Wakefield 2012[227]	Y	N	Y	N	N	Higher	One region, 19% response rate; however, demographics compared with another study
Walders 2003[300]	N	N	N	N	N	Lower	
Wassenaar 2007[178]	Y	N	N	N	N	Lower	Single state
Watson 2001b[195]	N	N	N	N	N	Lower	Referrals to a single centre
Xu 2002[235]	N	N	N	Y	N	Lower	Use of subjective measure
Zielinski 2008[166]	Y	N	N	N	N	Lower	Data from one city and region

N, no; PCP, primary care provider; Y, yes.

Quality appraisal: qualitative studies

Potential risk of bias	Bias present?
1. Was there a clear statement of the aim of the research?	Yes/no
2. Is a qualitative methodology appropriate to address the aims of the research?	Yes/no
3. Was the recruitment strategy appropriate to the aims of the research?	Yes/no/unclear
4. Were the data collected in a way that addressed the research issue?	Yes/no/unclear
5. Has the relationship between researcher and participant been adequately considered?	Yes/no
6. Have ethical issues been taken into account?	Yes/no/unclear
7. Was the data analysis sufficiently rigorous?	Yes/no
8. Is there a clear statement of findings?	Yes/no

Table of qualitative studies

First author and date	1. Was there a clear statement of the aim of the research? (Y/N)	2. Is a qualitative methodology appropriate to address the aims of the research? (Y/N)	3. Was the recruitment strategy appropriate to the aims of the research? (Y/N/unclear)	4. Were the data collected in a way that addressed the research issue? (Y/N/unclear)	5. Has the relationship between researcher and participant been adequately considered? (Y/N)	6. Have ethical issues been taken into account? (Y/N/unclear)	7. Was the data analysis sufficiently rigorous? (Y/N)	8. Is there a clear statement of findings? (Y/N)	Higher/lower risk of bias; details of concerns
Abel and Thompson 2011[20]	N	Y	Unclear	Y	Y	Y	N	N	Higher Aims not fully clear Process for selection of participants unclear Data not clearly distinguished from report of other authors' work
Allareddy 2007[232]	Y	Y	N	Y	N	N	Y	Y	Lower Detail of interviewer not provided, convenience sample, lack of discussion of ethics relating to focus groups
Baker 2006[192]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Beel 2008[226]	Y	Y	Y	Y	N	Y	Y	Y	Lower
Berendsen 2007[237]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Blundell 2012[253]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Bowling 2006[273]	Y	Y	Y	Y	Y	Y	Y	Y	Lower Mixed-methods study; however, qualitative data predominate

First author and date	1. Was there a clear statement of the aim of the research? (Y/N)	2. Is a qualitative methodology appropriate to address the aims of the research? (Y/N)	3. Was the recruitment strategy appropriate to the aims of the research? (Y/N/unclear)	4. Were the data collected in a way that addressed the research issue? (Y/N/unclear)	5. Has the relationship between researcher and participant been adequately considered? (Y/N)	6. Have ethical issues been taken into account? (Y/N/unclear)	7. Was the data analysis sufficiently rigorous? (Y/N)	8. Is there a clear statement of findings? (Y/N)	Higher/lower risk of bias; details of concerns
Brien 2008[258]	Y	Y	Y	Y	N	Y	Y	Y	Lower No details of interviewer
Bruyninckx 2009[209]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Calnan 2007[207]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Chew-Graham 2008[229]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Clemence 2003[228]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Cornford 2004[218]	Y	Y	Y	Y	N	N	Y	Y	Lower Ethical issues regarding discarding potential participant replies, patients unaware of intervention. Interviewed by professional involved in service
Dagneaux 2012[230]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Davies 2007[256]	Y	Y	Y	Y	Y	Y	Y	Y	Lower Mixed method; qualitative data predominates
Edwards 2002[257]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Espeland 2003[217]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Greenaway 2006[306]	Y	Y	Y	Y	Y	Y	Y	Y	Lower Survey with free text so limited qualitative data

First author and date	1. Was there a clear statement of the aim of the research? (Y/N)	2. Is a qualitative methodology appropriate to address the aims of the research? (Y/N)	3. Was the recruitment strategy appropriate to the aims of the research? (Y/N/unclear)	4. Were the data collected in a way that addressed the research issue? (Y/N/unclear)	5. Has the relationship between researcher and participant been adequately considered? (Y/N)	6. Have ethical issues been taken into account? (Y/N/unclear)	7. Was the data analysis sufficiently rigorous? (Y/N)	8. Is there a clear statement of findings? (Y/N)	Higher/lower risk of bias; details of concerns
Holley 2010[293]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Knight 2003[177]	Y	Y	Y	Y	Y	N	Y	Y	Lower Reporting of methods potentially identifies participants
Morgan 2007[210]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Nandy 2001[204]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Pomeroy 2010[176]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Rosen 2007[252]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Rowlands 2001[182]	Y	Y	Y	Y	Y	Y	Y	Y	Lower Data part of RCT
Ruston 2004[194]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Sigel and Leiper 2004[201]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Stavrou 2009[249]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Thorsen 2012[239]	Y	Y	Y	Y	Y	Y	Y	Y	Lower
Van der Weijden 2002[212]	Y	Y	Y	Y	Y	Y	Y	Y	Lower

First author and date	1. Was there a clear statement of the aim of the research? (Y/N)	2. Is a qualitative methodology appropriate to address the aims of the research? (Y/N)	3. Was the recruitment strategy appropriate to the aims of the research? (Y/N/unclear)	4. Were the data collected in a way that addressed the research issue? (Y/N/unclear)	5. Has the relationship between researcher and participant been adequately considered? (Y/N)	6. Have ethical issues been taken into account? (Y/N/unclear)	7. Was the data analysis sufficiently rigorous? (Y/N)	8. Is there a clear statement of findings? (Y/N)	Higher/lower risk of bias; details of concerns
Wilkes 2009[213]	Y	Y	Y	Y	N	Y	Y	Y	Lower Detail of interviewer not provided
Young 2010[221]	Y	Y	N	Y	Y	Y	Y	Y	Lower GPs had already taken part in an earlier study

N, no; Y, yes.

Appendix 3 Data sources

MEDLINE In-Process & Other Non-Indexed Citations and MEDLINE via Ovid (1946 to present).

Cochrane Database of Systematic Reviews.

Cochrane Central Register of Controlled Trials.

Cochrane Methodology Register.

Database of Abstracts of Reviews of Effects.

Health Technology Assessment Database.

NHS Economic Evaluation Database.

All accessed via The Cochrane Library, published by John Wiley and Sons Ltd (from inception).

CINAHL via EBSCO (from inception).

EMBASE via Ovid (1974 to 13 November 2012).

PsycINFO via Ovid (1806 to week 1 November 2012).

Science Citation Index, Social Science Citation Index, Science Conference Papers Index, Social Science Conference Papers Index via Web of Science published by Thomson Reuters (from inception).

Scopus via Elsevier (from inception).

Applied Social Sciences Index and Abstracts (ASSIA) via ProQuest (from inception).

Sociological abstracts via ProQuest (from inception).

Social Policy and Practice via Ovid (1890s to October 2012).

International Bibliography of the Social Sciences (IBSS) via Proquest (from inception).

HMIC via NHS Evidence (from inception).

Health Business Elite via EBSCO (from inception).

Business Source Premier via EBSCO (from inception).

Emerald Management Reviews via www.emeraldinsight.com/products/reviews/index.htm (from inception).

EPPI Centre databases: Bibliomap, Database of Promoting Health Effectiveness Reviews (DoPHER), Trials Register of Promoting Health Interventions (TRoPHI) via http://eppi.ioe.ac.uk/ (from inception).

OpenGrey via www.opengrey.eu/ (from inception).

Opensource via www.greynet.org/greysourceindex.html (from inception).

Google Scholar via scholar.google.co.uk/ (from inception).

Appendix 4 Search strategies

Initial search

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R).

Date searched: 1946 to present.

Date of search: November 2012.

Search strategy:

1. *Primary Health Care/(31,226)
2. (primary care or general practitioner$or gp).ti. (38,162)
3. *Family practice/or *General practitioners/(38,225)
4. 1 or 2 or 3 (83,924)
5. (referral or referred or refer).ti. (10,316)
6. demand management.ti,ab. (141)
7. *'Referral and Consultation'/(17,682)
8. Specialisation/(20,898)
9. 5 or 6 or 7 or 8 (43,885)
10. 4 and 9 (4328)
11. limit 10 to yr = '2000-Current' (1978)

Phrase search

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R).

Date searched: 1946 to present.

Date of search: March 2013.

Search strategy:

1. 'referral management centre$'.mp. [mp = title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (7)
2. limit 1 to yr = '2000-Current' (7)

‘Clinical reasoning’ search

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R).

Date searched: 1946 to present.

Date of search: April 2013.

Search strategy:

1. (evidence based adj (practice or medicine)).ti,ab. (12,476)
2. Evidence-Based Practice/or Evidence-Based Medicine/(52,802)
3. 1 or 2 (57,837)
4. (gp or general practitioner).ti,ab. (36,865)
5. General Practice/or Family Practice/or General Practitioners/(62,491)
6. 4 or 5 (90,428)
7. (clinical reasoning or clinical judgement or problem solving or decision making or critical thinking).ti, ab. (73,412)
8. Clinical Competence/(60,196)
9. Problem Solving/(20,285)
10. 7 or 8 or 9 (145,906)
11. 3 and 6 and 10 (170)

‘Systems’ search

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R).

Date searched: 1946 to present.

Date of search: April 2013.

Search strategy:

1. referral.ti,ab. (54,436)
2. exp ‘Referral and Consultation’/(54,186)
3. 1 or 2 (96,206)
4. *’Appointments and Schedules’/(3226)
5. *Computer Systems/(3932)
6. *Information Systems/(11,904)
7. *Physician Incentive Plans/(1225)
8. (Proforma$or checklist$or appointment$or direct access or IT system* or informatics or software or electronic or outreach clinic$or specialist nurse$or patient review$or gatekeep$or nominated destination or financial incentive$or payment$).ti,ab. (233,486)
9. 4 or 5 or 6 or 7 or 8 (249,981)
10. 3 and 9 (5345)
11. ((doctor$or gp$or general practitioner$or physician$) adj3 (attitude$or behavio?r or knowledge)).ti, ab. (9324)
12. (patient$adj3 (attitude$or behavio?r or knowledge)).ti,ab. (19,104)
13. exp *attitude to health/or *health knowledge, attitudes, practice/(136,183)
14. 11 or 12 or 13 (158,409)
15. 10 and 14 (574)

Appendix 5 Excluded studies

Full paper excluded	Reason
Abraham AR. General practitioner's back pain referrals: easing the load? *J Integr Care Pathways* 2001;**5**:133–5	Clinical care focus
Abu-Ramadan MA. Making better use of scarce resources: the Palestinian experience, 1995–1999. *J Ambulatory Care Manage* 2002;**25**:63	Country
Agarwal A, Charles-Holmes S. Out patient waiting time for common skin conditions – do general practitioners and dermatologists have the same priorities? A questionnaire-based survey. *Clin Exp Dermatol* 2001;**26**:13–15	Clinical outcomes
Agyapong VIO. Shared care between specialised psychiatric services and primary care. *Int J Psychiatry Med* 2011;**42**:295–313	Focus on diagnosis and care
Allen D, O'Brien T, Popert R. The two-week-wait cancer initiative in urology: useful modernisation? *J R Soc Med* 2004;**97**:279–81	Clinical outcomes
Allgar VL, Neal RD, Ali N, Leese B, Heywood P, Proctor G, *et al.* Urgent GP referrals for suspected lung, colorectal, prostate and ovarian cancer. *Br J Gen Pract* 2006;**56**:355–62	Clinical outcomes
Andrews KV, Penny JR, King PA. Are patients referred for NHS-funded dental implant treatment being selected in accordance with national guidelines and subsequently funded by their primary care trust? *Ann R Coll Surg Engl* 2010;**92**:512–14	Dental, prevalence data
Anis AH, Guh DP, Lacaille D, Marra CA, Rashidi AA, Li X, *et al.* When patients have to pay a share of drug costs: effects on frequency of physician visits, hospital admissions and filling of prescriptions. *CMAJ* 2005;**173**:1335–40	Effect on prescribing not referral
Annells M, Allen J, Nunn R, Lang L, Petrie E, Clark E, *et al.* An evaluation of a mental health screening and referral pathway for community nursing care: nurses' and general practitioners' perspectives. *J Clin Nurs* 2011;**20**:214–26	Nursing referral to GP rather than primary to secondary
Anthony D. Changing the nature of physician referral relationships in the US: the impact of managed care. *Soc Sci Med* 2003;**56**:2033–44	Background discursive paper
Anthony JS, Baik SY, Bowers BJ, Tidjani B, Jacobson CJ, Susman J, *et al.* Conditions that influence a primary care clinician's decision to refer patients for depression care. *Rehabil Nurs* 2010;**35**:113–22	Background discursive paper
Apostolopoulos DL. Completeness of referral details to rheumatologists from general practice. Poster presented at the Austin Life Sciences Research Week, Victoria, Australia, October 2010	Conference paper
Argenziano G, Puig S, Zalaudek I, Sera F, Corona R, Alsina M, *et al.* Dermoscopy improves accuracy of primary care physicians to triage lesions suggestive of skin cancer. *J Clin Oncol* 2006;**24**:1877–82	New intervention in primary care. Not about referral
Augestad KMR. The One-stop trial: does electronic referral and booking by the general practitioner (GPs) to outpatient day case surgery reduce waiting time and costs? A randomised controlled trial protocol. *BMC Surg* 2008;**8**:14	Looks at reducing waiting times, not referral
Auladell MA, Caballeria L, Pera G, Rodriguez L, Casas JD, Aznar J, *et al.* Adequacy and quality of abdominal echographies requested by primary care professionals. *BMC Gastroenterol* 2010;**10**:101	Study protocol
Carlsen B, Norheim OF. Introduction of the patient-list system in general practice. Changes in Norwegian physicians' perception of their gatekeeper role. *Scand J PrimHealth Care* 2003;**21**:209–13	Practitioner awareness of gatekeeper role, not referrals
Bal GI, Sellier E, Gennai Sp, Caillis M, François P, Pavese P. Infectious disease specialist telephone consultations requested by general practitioners. *Int J Psychiatry Med* 2011;**43**:912–17	Discussion of the technology used (technical features)
Bal R, Mastboom F, Spiers HP, Rutten H. The product and process of referral: optimising general practitioner-medical specialist interaction through information technology. *Int J Med Inf* 2007;**76**(Suppl. 1):28–34	Discussion of the technology used (technical features)

Full paper excluded	Reason
Barnes JJP. Why do general dental practitioners refer to a specific specialist endodontist in practice? *Int Endod J* 2011;**44**:21–32	Clinical outcomes (conditions referred)
Bassi A, Sturgess R, Bodger K. Impact of a rapid access upper GI cancer service (RAUGICS) on direct referrals for endoscopy from primary care. *Gastroenterology* 2002;**122**:A485–6	Audit of resource use
Baughan PK. Urgent suspected cancer referrals from general practice: audit of compliance with guidelines and referral outcomes. *Br J Gen Pract* 2011;**61**:e700–6	Clinical outcomes (types of cancer referred)
Baumeister T, Weistenhöfer W, Drexler H, Kütting B. Prevention of work-related skin diseases: teledermatology as an alternative approach in occupational screenings. *Contact Dermatitis* 2009;**61**:224–30	Not primary care
Becker A, Leonhardt C, Kochen MM, Keller S, Wegscheider K, Baum E, *et al.* Effects of two guideline implementation strategies on patient outcomes in primary care – a cluster randomised controlled trial. *Spine (Phila Pa 1976)* 2008;**33**:473–80	Primary care only, not referral
Ben-Arye E, Frenkel M. Referring to complementary and alternative medicine – a possible tool for implementation. *Complement Ther Med* 2008;**16**:325–30	Validation of tool for referral to CAM
Benjamin C, Booth K. Integrating care across traditional service boundaries; problems encountered during referral from primary care to cancer services for a family history of breast cancer. *Psychooncology* 2002;**11**:547	Conference abstract
Benjamin C, Ellis I. Realisation of risk: a central process involved in initiating referral from primary care due to a family history of breast cancer. *J Medical Genetics* 2005;**42**:S124	Conference abstract
Berendsen AJ, Benneker WH, Schuling J, Rijkers-Koorn N, Slaets JP, Meyboom-de JB, *et al.* Collaboration with general practitioners: preferences of medical specialists–a qualitative study. *BMC Health Serv Res* 2006;**6**:155	Describes specialist views of GPs
Berendsen AJ, de Jong GM, Schuling J, Bosveld HE, de Waal MW, Mitchell GK, *et al.* Patient's need for choice and information across the interface between primary and secondary care: a survey. *Patient Educ Couns* 2010;**79**:100–5	Hospital choice
Berendsen AJ, Kuiken A, Benneker W, de Jong BM, Voorn T, Schuling J. How do general practitioners and specialists value their mutual communication? A survey. *BMCHealth Serv Res* 2009;**9**:143	Clinical outcomes
Bhatt R, Rajesh A, Morgan B, Finlay D, Bhatt R, Rajesh A, *et al.* An audit of hip radiographs performed for general practitioners. *Clin Radiol* 2001;**56**:970–2	Referral rates
Boggis AR, Cornford CS. General Practitioners with special clinical interests: a qualitative study of the views of doctors, health managers and patients. *Health Policy* 2007;**80**:172–8	Does not consider referral
Borgermans L, Goderis G, Van Den Broeke C, Verbeke G, Carbonez A, Ivanova A, *et al.* Interdisciplinary diabetes care teams operating on the interface between primary and specialty care are associated with improved outcomes of care: findings from the Leuven Diabetes Project. *BMC Health Serv Res* 2009;**9**:179	Intervention to improve GP clinical management of patients rather than onward referral
Bratton RL, Cody C. Telemedicine applications in primary care, a geriatric pilot project. *Mayo Clin Proc* 2000;**75**:365–8	Primary care only. Not about referral
Brealey SD. Influence of magnetic resonance of the knee on GPs' decisions: a randomised trial. *Br J Gen Pract* 2007;**57**:622–9	Clinical outcomes not about improving referral
Brez S.Rowan. Transition from specialist to primary diabetes care: a qualitative study of perspectives of primary care physicians. *BMC Fam Pract* 2009;**10**:39	Relates to care after the referral and specialist appointment
Butler R, Oyewole D, Pitt B. What is the relationship between general practitioners' community referrals, and hospital referrals to an old age psychiatric service? *Ageing Ment Health* 2000;**4**:79–81	Describes differences in referral rates but does not explore factors
Campbell KH, Dale W, Stocking CB, Hemmerich JA, Smith SG, Sachs GA. Primary care physician referral decisions for older patients with chronic kidney disease: a pilot study. *J Am Geriatr Soc* 2007;**55**:S34	Effect of subspecialty of referrer on referral rates
Cape J, Parham A. Rated casemix of general practitioner referrals to practice counsellors and clinical psychologists: a retrospective survey of a year's caseload. *Br J Med Psychol* 2001;**74**:237–46	Clinical factors

Full paper excluded	Reason
Capper RC. Is there agreement among general practitioners, paediatricians and otolaryngologists about the management of children with recurrent tonsillitis? *Clin Otolaryngol Allied Sci* 2001;**26**:371–8	Clinical factors
Cardiff Uni. *Evaluation of Referral Management Pilots in Wales*. URL: www.wales.nhs.uk/sitesplus/documents/829/Referral%20Management%20Pilots%20in%20Wales%20-%20Follow%20Up%20Review%20Final%20Report.PDF (accessed 16 January 2014)	Describes setting up of RMC, no data on impact on referral, etc.
Carey T, Mullan R. GP referral guidelines: is there another side to the coin? *Clin Psychol Forum* 2007;**170**:29–32	Discussion paper
Carli P, De Giorgi V, Crocetti E, Caldini L, Ressel C, Giannotti B. Diagnostic and referral accuracy of family doctors in melanoma screening: effect of a short formal training. *Eur J Cancer Prev* 2005;**14**:51–5	Improving clinical skills of doctors
Chan B, Proudfoot J, Zwar N, Davies GP, Harris MF. Satisfaction with referral relationships between GP and allied health professionals. *Aust J Prim Health* 2011;**17**:250–8	Validation of tool
Checkland K, Coleman A, Harrison S, Hiroeh U. *Practice Based Commissioning in the National Health Service: Interim Report of a Qualitative Study*. 2008. URL: www.population-health.manchester.ac.uk/primarycare/npcrdc-archive/Publications/PBC_INTERIM_REPORT.pdf (accessed 16 January 2014)	List of interventions only (pp. 52–3)
Chen AH, Yee HF Jr. Improving primary care-specialty care communication: lessons from San Francisco's safety net: comment on 'Referral and consultation communication between primary care and specialist physicians'. *Arch Intern Med* 2011;**171**:65–7	Commentary on O'Malley paper on communication systems. Useful references on electronic referral systems – have printed
Chenot JF, Scherer M, Becker A, Donner-Banzhoff N, Baum E, Leonhardt C, *et al.* Acceptance and perceived barriers of implementing a guideline for managing low back in general practice. *Implement Sci* 2008;**3**:7	Guidlines for low-back pain in primary care – not about referral
Chenot J-FL. The impact of specialist care for low back pain on health service utilisation in primary care patients: a prospective cohort study. *Eur J Pain* 2008;**12**:275–83	Clinical characteristics of patients referred
Chew GC, Dowrick C, Wearden A, Richardson V, Peters S. Making the diagnosis of Chronic Fatigue Syndrome/Myalgic Encephalitis in primary care: a qualitative study. *BMC Fam Pract* 2010;**11**:16	Diagnosis and clinical care only
Clarkson JE, Turner S, Grimshaw JM, Ramsay CR, Johnston M, Scott A, *et al.* Changing clinicians' behaviour: a randomised controlled trial of fees and education. *J Dent Res* 2008;**87**:640–4	Impact of cost on dental procedures
Coady DA, Abdullah S, Mangion P, Chuck A. Missing out the middle man … direct access GP referrals for carpal tunnel tests. *Rheumatology (Oxford)* 2005;**44**:I59	Conference abstract
Coast J, Noble S, Noble A, Horrocks S, Asim O, Peters TJ, *et al.* Economic evaluation of a general practitioner with special interests led dermatology service in primary care. *BMJ* 2005;**331**:1444–9	Cost only, no referral outcomes
Collins K, Walters W, Bowns I. Patient satisfaction with teledermatology. *J Telemed Telecare* 2004;**10**:29–33	Change to secondary clinical care
Corbett M, Foster N, Ong BN. GP attitudes and self-reported behaviour in primary care consultations for low back pain. *Fam Pract* 2009;**26**:359–64	Guidelines relating to clinical care of back pain rather than referral
Corey K. An analysis of terminology used by primary care physicians to describe concerning lesions referred to an urgent dermatology clinic. Presentation at the Triennial Research Conference, Marbella, Spain, November 2012	Exclude: conference abstract
Coulston JE, Williams GL, Stephenson BM, Coulston JE, Williams GL, Stephenson BM. Audit of referral patterns for hernia repair – are general practitioners aware of the changing face of herniorrhaphy? *Ann R Coll Surg Engl* 2008;**90**:140–1	Clinical focus
Cressey D. Simple tool can aid GPs' stroke referral. *Pulse* 2006;**66**:20	Tool validation
Crimlisk HL, Bhatia KP, Cope H, David AS, Marsden D, Ron MA. Patterns of referral in patients with medically unexplained motor symptoms. *J Psychosom Res* 2000;**49**:217–19	Clinical focus
Daggett P. Referral management centres and diabetes. *Practical Diabetes International* 2007;**24**:119–20	Discussion article

Full paper excluded	Reason
DAMASK (Direct Access to Magnetic Resonance Imaging: Assessment for Suspect Knees) Trial Team. Effectiveness of GP access to magnetic resonance imaging of the knee: a randomised trial. *Br J Gen Pract* 2008;**58**:e1–8	Clinical rather than service outcomes
Davenport TE, Watts HG, Kulig K, Resnik C. Current status and correlates of physicians' referral diagnoses for physical therapy. *J Orthop Sports Phys Ther* 2005;**35**:572–9	Information content of referral letters
Davey CJ, Green C, Elliott DB, Davey CJ, Green C, Elliott DB. Assessment of referrals to the hospital eye service by optometrists and GPs in Bradford and Airedale. *Ophthalmic Physiol Opt* 2011;**31**:23–8	Clinical characteristics of referrals
De Bondt BA, Aartman IH, Zentner A. Referral patterns of Dutch general dental practitioners to orthodontic specialists. *Eur J Orthod* 2010;**32**:548–54	Rates of referral only
Del Poggio P, Jamoletti C, Iazzetti M, Filippi A, Mattiello M, Mazzoleni M, *et al.* Management and referral patterns of patients with hepatitis C by primary care physicians: impact of an educational programme. *J Hepatol* 2000;**32**:178	Conference abstract, no data
Della Rossa AN. Diagnosis and referral of rheumatoid arthritis by primary care physician: Results of a pilot study on the city of Pisa, Italy. *Clin Rheumatol* 2010;**29**:71–81	Exclude: about disease prevalence/diagnosis, not referral
Delnoij D, Van Merode G, Paulus A, Groenewegen P. Does general practitioner gatekeeping curb health care expenditure? *J Health Serv Res Policy* 2000;**5**:22–6	No referral outcomes
Devereux C, Eedy DJ. An audit of the implementation of a policy of not accepting GP referrals of benign cosmetic skin lesions. *Br J Dermatol* 2009;**161**:67	No data, brief report (abstract)
Deweese D, Franklin MD. Managing referrals and referral specialists. *Fam Pract Manag* 2012;**19**:10	Letter/comment only
Dorr DA, Wilcox A, McConnell KJ, Burns L, Brunker CP, Dorr DA, *et al.* Productivity enhancement for primary care providers using multicondition care management. *Am J Manag Care* 2007;**13**:22–8	Efficiency of GP working practice rather than referral
Eccles M, Steen N, Grimshaw J, Thomas L, McNamee P, Soutter J, *et al.* Effect of audit and feedback, and reminder messages on primary-care radiology referrals: a randomised trial. *Lancet* 2001;**357**:1406–9	Primary care intervention, not about referral
Eide MJA. Web-based curriculum improves primary care providers' skin cancer detection skills. Presentation at the Triennial Research Conference, Marbella, Spain, November 2012	Abstract
Eisinger F, Pivot X, Coscas Y, Viguier J, Calazel-Benque A, Blay JY, *et al.* Impact of general practitioners' sex and age on systematic recommendation for cancer screening. *Eur J Cancer Prev* 2011;**20**(Suppl. 1):39–41	GP inviting patients for screening rather than referral
Enns SM, Muma RD, Lary MJ. Examining referral practices of primary care physician assistants. *JAAPA* 1986;**13**:81–4	Not relevant to question
Evaluation of a GP referral service for manual treatment of back and neck pain. *Clinical Chiropractic* 2012;**15**:89–90	Providing new GP service. Not about referral
Evans JW. Clinician opinions about the appropriateness and severity of general practitioner referrals to specialist mental health services: a cross-sectional survey. *Primary Care Psychiatry* 2002;**8**:91–4	Describes issues in clinicians deciding appropriateness
Fauchais A, Demaziereb K, Ly K, Gondran G, Bezanahary H, Liozon E, *et al*. Interface between general practitioners and specialists in SSc management. *Rheumatology* 2012;**51**(Suppl. 2):ii98	Exclude: conference abstract
Feldman S. The referral dance: improving the interface between primary care practitioners and specialists caring for patients with dementia. *Am J Alzheimers Dis Other Demen* 2009;23	Audit of referral rates – no intervention
Fenton JJ, Levine MD, Mahoney LD, Heagerty PJ, Wagner EH, Fenton JJ, *et al.* Bringing geriatricians to the front lines: evaluation of a quality improvement intervention in primary care. *J Am Board Fam Med* 2006;**19**:331–9	Clinical outcomes
Finch R. Specialist GPs 'cut referrals by 80%'. *Pulse* 2004;**64**:9	No data. But cites *Pulse*, 17 May 2004

Full paper excluded	Reason
Fisher LW. Comparison of specialty referral patterns of primary care providers. *J Healthc Manag* 2002;**47**:197–204	Acute interhospital referrals
Fitzgerald A, de Coster C, McMillan S, Naden R, Armstrong F, Barber A, *et al.* Relative urgency for referral from primary care to rheumatologists: the Priority Referral Score. *Arthritis Care Res* 2011;**63**:231–9	Describes the development of a rating scale for referral criteria
Font B, Lahoz R, Casamor R, Escalada FJ, Ezjurra P, Ferrer JC, *et al.* Criteria for referral of type 2 diabetes patients from primary care to specialised care and vice versa in Spain. Pathways study. *Value Health* 2011;A483	Exclude: conference abstract
Ford S, Schofield T, Hope T. Observing decision-making in the general practice consultation: who makes which decisions? *Health Expect* 2006;**9**:130–7	Do parents believe they contribute to decision? Not linked to referral rate
Forrest B. Primary care gatekeeping and referrals: effective filter or failed experiment? *BMJ* 2003;**326**:692–5	Discussion article
Forrest CB, Majeed A, Weiner JP, Carroll K, Bindman AB, Forrest CB, *et al.* Comparison of specialty referral rates in the United Kingdom and the United States: retrospective cohort analysis. *BMJ* 2002;**325**:370–1	Describes patters of referrals only
Forrest CB, Majeed A, Weiner JP, Carroll K, Bindman AB. Referral of children to specialists in the US and UK. *Arch Pediatr Adolesc Med* 2003;**157**:279–85	Comparison of referral rates, no intervention
Forrest CB, Reid RJ. Prevalence of health problems and primary care physicians' specialty referral decisions. *J Fam Pract* 2001;**50**:427–32	Types of health problem referred
French EM. Referral patterns of elderly persons to psychotherapy by primary care providers at a community health center. *Clin Gerontol* 2000;**21**	Referrals within community
Freund T, Peters KF, Rochon J, Mahler C, Gensichen J, Erler A, *et al.* Primary care practice-based care management for chronically ill patients (PraCMan): study protocol for a cluster randomised controlled trial [ISRCTN56104508]. *Trials* 2011;**12**:163	Study protocol only
Frost DW, Toubassi D, Detsky AS. Rethinking the consultation process: optimising collaboration between primary care physicians and specialists. *Can Fam Physician* 2012;**58**:825–8	Discussion piece
Fuat A, Murphy JJ, Mehrzad AA, Johnston JI, Smellie WSA, Brennan G. Suspected heart failure in primary care – the utility of N-terminal pro b-type natriuretic peptide (NT proBNP) as a pre-screening test for secondary care referral – a real life study. *Eur Heart J* 2005;**26**:181	Cost-effectiveness study of alternative methods of diagnosis heart failure in primary care
Gabel JR, Fahlman C, Kang R, Wozniak G, Kletke P, Hay JW. Where do I send thee? Does physician-ownership affect referral patterns to ambulatory surgery centers? *Health Aff (Millwood)* 2008;**27**:w165–74	General trends in referral only
Gabel S. Innovations in Practice: child and adolescent psychiatrists and primary care – innovative models of consultation in the United States. *Child Adolesc Ment Health* 2012;**17**:252–5	Treatment options
Garasen H, Johnsen R. The quality of communication about older patients between hospital physicians and general practitioners: a panel study assessment. *BMC Health Serv Res* 2007;**7**:133	Exclude: quality of hospital discharge letters
Garrido T, Jamieson L, Zhou YU, Wiesenthal A, Liang L. Effect of electronic health records in ambulatory care. BMJ 2005;330:581	Attendance in primary and secondary care, not about referral
Gask L, Dowrick C, Dixon C, Sutton C, Perry R, Torgerson D, *et al.* A pragmatic cluster randomised trial of an educational intervention for GPs in the assessment and management of depression. *Psychol Med* 2004;**34**:63–72	Clinical outcomes
Gately S. E-referral and e-triage as mechanisms for enhancing and monitoring patient care across the primary-secondary provider interface. *J Telemed Telecare* 2003;**9**:350–2	Letter
George S, Pockney P, Primrose J, Smith H, Little P, Kinley H, *et al.* A prospective randomised comparison of minor surgery in primary and secondary care. The MiSTIC trial. *Health Technol Assess* 2008;**12**(23)	Safety of minor operations performed in GP rather than hospital

Full paper excluded	Reason
Gillooly J, Tang V, Walker R. Assessing use of the two-week rule in urology. *Br J Healthc Manage* 2009;**15**:397–400	Clinical outcomes
Gjessing KF. Exploring factors that affect hospital referral in rural settings: a case study from Norway. *Rural Remote Health* 2009;**9**:975	Clinical diagnosis of patients referred
Gonzalez P. Gatekeeping versus direct-access when patient information matters. *Health Econ* 2010;**19**:730–54	Gatekeeping and cost analysis
Goodey RD, Brickley MR, Hill CM, Shepherd JP. A controlled trial of three referral methods for patients with third molars. *Br Dent J* 2000;**189**:556–60	Not hospital care
Gormley GJ, Steele WK, Gilliland A, Leggett P, Wright GD, Bell AL, *et al.* Can diagnostic triage by general practitioners or rheumatology nurses improve the positive predictive value of referrals to early arthritis clinics? *Rheumatology (Oxford)* 2003;**42**:763–8	Clinical and diagnostic skills of staff
Burn K. GP initiative streamlines referrals. *Pulse* 2004;**64**:2–3	Three-paragraph *Pulse* article. No useable data
Graffen M, Saligari M, Le Couteur DG, Naganathan V, McLean A, Graffen M, *et al.* Development of a mentorship programme for rural general practitioners by visiting specialist physicians. *Rural Remote Health* 2005;**5**:374	Letter; no data
Granlund H, Thoden CJ, Carlson C, Harno K. Realtime teleconsultation versus face to face consultation in dermatology. *J Telemed Telecare* 2003;**9**:204–9	Change to secondary clinical care
Grant C, Gallier L, Fahey T, Pearson N, Sarangi J, Grant C, *et al.* Management of menorrhagia in primary care-impact on referral and hysterectomy: data from the Somerset Morbidity Project. *J Epidemiol Community Health* 2000;**54**:709–13	Clinical outcomes
Grant C, Goodenough T, Harvey I, Hine C. A randomised controlled trial and economic evaluation of a referrals facilitator between primary care and the voluntary sector. *BMJ* 2000;**320**:419–23	Looks at the benefits of additional care on mental well-being
Grembowski DE, Martin D, Patrick DL, Diehr P, Katon W, Williams B, *et al.* Managed care, access to mental health specialists, and outcomes among primary care patients with depressive symptoms. *J Gen Intern Med* 2002;**17**:258–69	Changed pattern of clinical care and access to mental health specialist rather than referral management, mental health outcomes
Grimshaw JM, Zwarenstein M, Tetroe JM, Godin G, Graham ID, Lemyre L, *et al.* Looking inside the black box: a theory-based process evaluation alongside a randomised controlled trial of printed educational materials (the Ontario printed educational message, OPEM) to improve referral and prescribing practices in primary care in Ontario, Canada. *Implement Sci* 2007;**2**:38	Study protocol only; no other papers found reporting data on Google search marked as in progress on project website
Gruen RL, Knox S, Britt H, Bailie RS. The Surgical Nosology in Primary-care Settings (SNIPS): a simple bridging classification for the interface between primary and specialist care. *BMC Health ServRes* 2001;**4**:8	Development of a classification system – no evaluation of the system
Guarnaccia S, Lombardi A, Gaffurini A, Chiarini M, Domenighini S, D'Agata E, *et al.* Application and implementation of the GINA asthma guidelines by specialist and primary care physicians: a longitudinal follow-up study on 264 children. *PrimCare Respir J* 2007;**16**:357–62	Describes clinical management of asthma rather than referral systems
Gucciardi E, Chan V, Fortugno M, Khan S, Horodezny S, Swartzack S. Primary care physician referral patterns to diabetes education programs in Southern Ontario, Canada. *Can J Diabetes* 2011;**35**:262–8	Referral within primary care
Gulzar Z, Goff S, Njindou A, Hearty H, Rafi I, Savage R, *et al.* Nurse-led cancer genetics clinics in primary and secondary care in varied ethnic population areas: interaction with primary care to improve ascertainment of individuals from ethnic minorities. *Fam Cancer* 2007;**6**:205–12	New service provision rather than demand management
Haggstrom DA, Phillips KA, Liang SY, Haas JS, Tye S, Kerlikowske K, *et al.* Variation in screening mammography and Papanicolaou smear by primary care physician specialty and gatekeeper plan (United States). *Cancer Causes Control* 2004;**15**:883–92	Likelihood of GP doing the screening test rather than referral related
Hamilton W, Round A, Sharp D. Patient, hospital, and general practitioner characteristics associated with non-attendance: a cohort study. *Br J Gen Pract* 2002;**52**:317–9	Looks at non-attendance at specialist

Full paper excluded	Reason
Harbison J, Davis J, Louw S, Sen B, Ford G. Comparison of stroke unit referrals by general practitioner (GP), emergency room (ER) doctors and ambulance paramedics using a rapid screening tool. *Stroke* 2000;**31**:2833	Considers paramedics ability to diagnose stroke
Hartveit M, Biringer E, Vanhaeht K, Haug K, Aslaksen A. The Western Norway mental health interface study: a controlled intervention trial on referral letters between primary care and specialist mental health care. *BMC Psychiatry* 2011;**11**:177	Study protocol only, looked for study papers presumably still in progress
Hirsch O, Trager S, Bosner S, Ilhan M, Becker A, Baum E, *et al.* Referral from primary to secondary care in Germany: Developing a taxonomy based on cluster analysis. *Scand J Public Health* 2012;**40**:571–8	Taxonomy of referrals – types of referrals not reasons
Ho CKY. Improving timely access to GI specialty care using an electronic referral management system (Ereferral) that links primary care providers (PCPS) and a GI Specialist. *Gastroenterology* 2011:S721	Conference abstract
Holbrook A, Pullenayegum E, Thabane L, Troyan S, Foster G, Keshavjee K, *et al.* Shared electronic vascular risk decision support in primary care. *Arch Intern Med* 2011;**171**:1736–44	Clinical outcomes, not about referral
Holdsworth LK, Webster VS, McFadyen AK. The Scottish Physiotherapy Self Referral Study Group. Self-referral to physiotherapy: deprivation and geographical setting. Is there a relationship? Results of a national trial. *Physiotherapy* 2006;**92**:16–25	Not hospital care
Hollingworth W, Todd CJ, King H, Males T, Dixon AK, Karia KR, *et al.* Primary care referrals for lumbar spine radiography: diagnostic yield and clinical guidelines. *Br J Gen Pract* 2002;**52**:475–80	No intervention; data regarding general trends only
Horrocks S, Coast J. Patient choice: an exploration of primary care dermatology patient values and expectations of care. *Qual Prim Care* 2007;**15**:185–93	Clinical care focus rather than managing demand
Hoyle JL, Hussey L, Agius R. Occupational asthma; referral patterns from primary care in the UK. *Thorax* 2010;**65**:A72	Exclude: conference abstract
Hsu EY, Schwend RM, Julia L. How many referrals to a pediatric orthopaedic hospital specialty clinic are primary care problems? *J Pediatr Orthop* 2012;**32**:732–6	Clinical care focus rather than managing demand
Isinkaye T, Gilbert S, Seddon P, Smith H. What proportion of paediatric allergy referrals could be dealt with in primary care? *J Allergy Clin Immunol* 2011;**127**:AB118	Exclude: conference abstract
Jankowski RF. Implementing national guidelines at local level: changes in clinicians' behaviour in primary care need to be reflected in secondary care. *BMJ* 2001;**322**:1258–9	Discussion article
Jiwa M. Referral from primary to secondary care. *BMJ* 2010;**341**:c6175	Editorial comment
Jiwa MB. GP letter writing in colorectal cancer: a qualitative study. *Curr Med Res Opin* 2002;**18**:342–6	Quality of letter writing in critical care
Jiwa MH. Referral of suspected colorectal cancer: Have guidelines made a difference? *Br J Gen Pract* 2004;**54**:608–10	Opinion piece
Johansen ECJ. Tympanometry for diagnosis and treatment of otitis media in general practice. *Fam Pract* 2000;**17**:317–22	Evaluation of the treatment, not the referral process
Johansson B, Berglund G, Hoffman K, Glimelius B, Sjöden PO. The role of the general practitioner in cancer care and the effect of an extended information routine. *Scand J Prim Health Care* 2000;**18**:143–8	Information exchange between GP and specialist – patient already referred
John SK, George S, Howell RD, Primrose JN, Fozard JB. Validation of the lower gastrointestinal electronic referral protocol. *Br J Surg* 2008;**95**:506–14	Tool validation
Jones R, Rosen R, Tomlin Z, Cavanagh M, Oxley D. General practitioners with special interests: evolution and evaluation. *J Health Serv Res Policy* 2006;**11**:106–9	Discussion paper
Kada S, Nygaard A, Geitung T, Mukesh N, Naik M. Quality and appropriateness of referrals for dementia patients. *Qual Prim Care* 2007;**15**:53–7	Describes poor content of letters but does not link to referral management
Kendrick T, Simons L, Mynors-Wallis L, Grey A, Lathlean J, Pickering R, *et al.* Cost-effectiveness of referral for generic care or problem-solving treatment from community mental health nurses, compared with usual general practitioner care for common mental disorders: randomised controlled trial. *Br J Psychiatry* 2006;**189**:50–9	Referral from one community service to another

Full paper excluded	Reason
King TM, Tandon SD, Macias MM, Healy JA, Duncan PM, Swigonski NL, *et al.* Implementing developmental screening and referrals: lessons learned from a national project. *Pediatrics* 2010;**125**:350–60	Emphasis on improving screening rather than referral
Klimidis S, Minas H, Kokanovic R. Ethnic minority community patients and the better outcomes in mental health care initiative. *Australas Psychiatry* 2006;**14**:212–5	Enabling patient access to service Queery
Krajcar NM. Improving primary to acute referrals: the role of the cancer clinical network in developing consistent information for general practitioners. *Asia-Pacific J Clin Oncol* 2011;**7**(Suppl. S4):117–95	Conference abstract
Kourkouta S, Darbar UR. An audit of the quality and content of periodontal referrals and the effect of implementing referral criteria. *Prim Dent Care* 2006;**13**:99–106	No actual referral outcomes
Krahn DD, Bartels SJ, Coakley E, Oslin DW, Chen H, McIntyre J, *et al.* PRISM-E: comparison of integrated care and enhanced specialty referral models in depression outcomes. *Psychiatr Serv* 2006;**57**:946–53	Clinical outcomes
Kuo DZ, Cheng TL, Rowe PC, Kuo DZ, Cheng TL, Rowe PC. Successful use of a primary care practice-specialty collaboration in the care of an adolescent with chronic fatigue syndrome. *Pediatrics* 2007;**120**:e1536–9	Case report/discussion
Kvamme OJ, Olesen F, Samuelsson M. Improving the interface between primary and secondary care. *Qual Health Care* 2001;**10**:33–9	Position statement, no empirical data
Kyprianou I, D'Souza A, Saravanappa N, Lewis DM, Courtney-Harris R, Kyprianou I, *et al.* Referral patterns in paediatric orbital cellulitis. *Eur J Emerg Med* 2005;**12**:6–9	Clinical focus
Laird S. *Referral Management Centres Lack Evidence*. 2006. URL: http://connection.ebscohost.com/c/articles/20941025/referral-management-centres-lack-evidence (accessed 16 January 2014)	News article on Welsh study (evaluation pilots)
Latinovic R, Gulliford M, Ridsdale L. Headache and migraine in primary care: consultation, prescription, and referral rates in a large population. *J Neurol Neurosurg Psychiatry* 2006;**77**:385–7	Rates of referrals not reasons
Leamon MH. When to refer patients for substance abuse assessment and treatment. *Prim Psychiatry* 2006;**13**(6)	Discussion editorial
Lear SA, MacKinnon D, Farias-Godoy A, Nasmith J, Mazowita G, Ignaszewski A. Rapid access to cardiology expertise: an innovative program to provide telephone support for family physicians. *Healthc Q* 2010;**13**:56–60	Clinical outcomes
Lees L. Developing a nurse led GP referral service. *Emerg Nurse* 2003;**11**:28–32	Referral to emergency care
Lehnert BE, Bree RL. Analysis of appropriateness of outpatient CT and MRI referred from primary care clinics at an academic medical center: how critical is the need for improved decision support? [Erratum published in *J Am Coll Radiol* 2010;**7**:466.] *J Am Coll Radiol* 2010;**7**:192–7	Clinical outcomes
Linden M, Gothe H, Ormel J. Pathways to care an psychological problems of general practitioners in a gatekeeper and an open access health care system: a comparison of Germany and the Netherlands. *Soc Psychiatry Psychiatr Epidemiol* 2003;**38**:690–7	Comparison of German and Dutch referral
Linnala A, Aromaa A, Mattila K. Specialists as consultants to GPs. Private sector services as an alternative way of organising consultant services in health care. *Scand J Prim Health Care* 2001;**19**:90–4	Increasing access using private sector rather than managing referral
Love T. Quality indicators and variation in primary care: modelling GP referral patterns. *Fam Pract* 2004;**21**:160–5	Prescribing rates by area
Lucas A, Smeenk F, Smeele I, Brouwer T, van Schayck O, Lucas A, *et al.* The validity of diagnostic support of an asthma/COPD service in primary care. *Br J Gen Pract* 2007;**57**:892–6	Increasing skills of GPs in COPD diagnosis
Ludwick DA, Lortie C, Doucette J, Rao J, Samoil-Schelstraete C. Evaluation of a telehealth clinic as a means to facilitate dermatological consultation: pilot project to assess the efficiency and experience of teledermatology used in a primary care network. *J Cutan Med Surg* 2010;**14**:7–12	Looks at speed of referral not quality

Full paper excluded	Reason
Maddock GR, Startup M, Carter GL. Patient characteristics associated with GP referral to the Access to Allied Psychological Services Program: a case–control study. *Aust NZ J Psychiatry* 2012;**46**:435–44	Types of clinical problems referred
Mahima H, Rajdeep G, Gary LL. Referral equity and referral management: the supplier firm's perspective. *Rev Marketing Res* 2010;**7**:93–144	Discussion article
Mannion R, Goddard M. General practitioners' assessments of hospital quality and performance. *Clin Governance* 2004;9:42–7	How GPs asses quality of hospital
Mariñoso BG, Jelovac I. GPs' payment contracts and their referral practice. *J Health Econ* 2003;**22**:617–35	Economic analysis of gatekeeping as a predictor of referral
Martens JD, Werkhoven MJ, Severens JL, Winkens RA. Effects of a behaviour independent financial incentive on prescribing behaviour of general practitioners. *J Eval Clin Pract* 2007;**13**:369–73	Drug prescribing, not referral
McGorm K, Burton C, Weller D, Murray G, Sharpe M. Patients repeatedly referred to secondary care with symptoms unexplained by organic disease: prevalence, characteristics and referral pattern. *Fam Pract* 2010;**27**:479–86	Frequently vs. regularly referred patients
McGraw E, Barthel H, Arrington M. A model for demand management in a managed care environment. *Mil Med* 2000;**165**:305–8	Referral to emergency care
McHugh A, Campbell M, Luker A. GP referral of patients with osteoarthritis for consideration of total joint replacement: a longitudinal study. *Br J Gen Pract* 2011;**61**:e459–68	Clinical variation
McIsaac WJ, Coyte P, Croxford R, Harji S, Feldman W, McIsaac WJ, *et al.* Referral of children with otitis media. Do family physicians and pediatricians agree? *Can Fam Physician* 2000;**46**:1780–2	Clinical predictors
McKay K. Evaluating model programs to support dissemination: an evaluation of strengthening the developmental surveillance and referral practices of child health providers. *J Dev Behav Pediatr* 2006;**27**(Suppl. 1):26–9	Satisfaction outcomes only – development of a tool
McKinstry B, Walker J, Campbell C, Heaney D, Wyke S. Telephone consultations to manage requests for same-day appointments: a randomised controlled trial in two practices. *Br J Gen Pract* 2002;**52**:306–10	Primary care only, not referral
Meadows GN, Harvey CA, Joubert L, Barton D, Bedi G. Best practices: the consultation-liaison in primary-care psychiatry program: a structured approach to long-term collaboration. *Psychiatr Serv* 2007;**58**:1036–8	Discussion piece
Menachemi N, Perkins RM, van Durme DJ, Brooks RG. Examining the adoption of electronic health records and personal digital assistants by family physicians in Florida. *Inform Prim Care* 2006;**14**:1–9	Use of technology and barriers to use
Meredith LS, Yano EM, Hickey SC, Sherman SE. Primary care provider attitudes are associated with smoking cessation counseling and referral. *Med Care* 2005;**43**:929–34	Not referral to hospital elective
Mitchell A, Keenan RA. Are Grampian general practitioners good gatekeepers for access to emergency general surgical care? *Scott Med J* 2008;**53**:33–5	Emergency
Mitchell GK, De Jong IC, Del Mar CB, Clavarino AM, Kennedy R. General practitioner attitudes to case conference: How can we increase participation and effectiveness? *Med J Aust* 2002;**177**:95–7	Nothing of relevance
Mondry A, Zhu AL, Loh M, Vo TD, Hahn K. Active collaboration with primary care providers increases specialist referral in chronic renal disease. *BMC Nephrol* 2004;**5**:16	Clinical outcomes
Montgomery JA, McGee HM, Shannon W, Donohoe J. Factors influencing general practitioner referral of patients developing end-stage renal failure: a standardised case-analysis study. *BMC Health Serv Res* 2006;**6**:114	Clinical reasons for referral
Moreno-Ramirez D, Ferrandiz L, Nieto-Garcia A, Carrasco R, Moreno-Alvarez P, Galdeano R, *et al.* Store-and-forward teledermatology in skin cancer triage: experience and evaluation of 2009 teleconsultations. *Arch Dermatol* 2007;**143**:479–84	Clinical measures not referral

Full paper excluded	Reason
Moreno-Ramirez D, Ferrandiz L, Ruiz-de-Casas A, Nieto-Garcia A, Moreno-Alvarez P, Galdeano R, *et al.* Economic evaluation of a store-and-forward teledermatology system for skin cancer patients. *J Telemed Telecare* 2009;**15**:40–5	Looks at cost only, not effect on referrals
Mostert MC, Richardus JH, de Man RA, Mostert MC, Richardus JH, de Man RA. Referral of chronic hepatitis B patients from primary to specialist care: making a simple guideline work. *J Hepatol* 2004;**41**:1026–30	Referral to public health department for notification of disease and then advice sent back to GP to onward refer
Murphy FM, James HD, Lloyd KR. Closer working with primary care is associated with a sharp increase in referrals to community mental health services. *J Ment Health* 2002;**11**:605–10	Community referrals not hospital care
Murray M. Reducing waits and delays in the referral process: by formalizing your referral relationships, you can make life easier for you and your patients. *Fam Pract Manag* 2002;**9**:39–42	Discussion editorial
Myfanwy D, Glyn E. Referral management centres: promising innovations or Trojan horses? *BMJ* 2006;**332**:844–8	Discussion paper
New JP, Mason JM, Freemantle N, Teasdale S, Wong L, Bruce NJ, *et al.* Educational outreach in diabetes to encourage practice nurses to use primary care hypertension and hyperlipidaemia guidelines (EDEN): a randomized controlled trial. *Diabet Med* 2004;**21**:599–603	Effect of guideline promotion on clinical outcomes
Nixon RM, Duffy SW, Fender GR, Day NE, Prevost TC. Randomization at the level of primary care practice: use of pre-intervention data and random effects models. Stat Med 2001;**20**:1727–38	Pre-intervention data only
Nor AM, Ford GA. Development of a primary care referral stroke identification tool (PRESIT). *Stroke* 2006;**37**:671–2	Poster abstract
Nutting PA, Gallagher K, Riley K, White S, Dickinson WP, Korsen N, *et al.* Care management for depression in primary care practice: findings from the RESPECT-Depression trial. *Ann Fam Med* 2008;**6**:30–7	Patient care focus
O'Dowd A. GP consortium agrees partnership with private firm to run referral service. *BMJ* 2011;**342**:c7470	Very short news article. No data
O'Brien C, Cambouropoulos P. Combating information overload: a six-month pilot evaluation of a knowledge management system in general practice. *Br J Gen Pract* 2000;**50**:489–90	Primary care only, not referral
O'Malley AS, Reschovsky JD. Referral and consultation communication between primary care and specialist physicians: finding common ground. *Arch Intern Med* 2011;**171**:56–65	Quality of care outcomes
Orden M, Hoffman T, Haffmans J, Spinhoven P, Hoencamp E. Collaborative mental health care versus care as usual in a primary care setting: a randomized controlled trial. *Psychiatr Serv* 2009;**60**:74–9	Looks at referral delay
Oslin DW, Grantham S, Coakley E, Maxwell J, Miles K, Ware J, *et al.* PRISM-E: comparison of integrated care and enhanced specialty referral in managing at-risk alcohol use. [Erratum published in *Psychiatr Serv* 2006;**57**:1492. Olsen, Ed (added); Kirchner, JoAnn E (added); Levkoff, Sue (added)]. *Psychiatr Serv* 2006;**57**:954–8	Clinical outcomes
Overland J, Mira M, Yue DK. Differential shared care for diabetes: does it provide the optimal partition between primary and specialist care? *Diabet Med* 2001;**18**:554–7	Clinical outcomes
Pallan M, Linnane J, Ramaiah S. Evaluation of an independent, radiographer-led community diagnostic ultrasound service provided to general practitioners. *J Public Health (Oxf)* 2005;**27**:176–81	Relocation of services, not referral
Park CHT. Factors influencing the periodontal referral process. *J Periodontol* 2011;**82**:1288–94	Clinical outcomes
Park JC, Ross AH, Tole DM, Sparrow JM, Penny J, Mundasad MV, *et al.* Evaluation of a new cataract surgery referral pathway. *Eye* 2009;**23**:309–13	Quality of referral information assessed in terms of clinical outcomes
Pattinson J. Primary care. Central reservations. *Health Serv J* 2003;**113**:30–1	Community services only

Full paper excluded	Reason
Penson DF. Re: Are men on 5alpha-reductase inhibitors appropriately referred to urology? A survey of primary care physicians. *J Urol* 2012;**188**:114	Clinical data
Piek E, van der Meer K, Penninx BWJH, Verhaak PFM, Nolen WA. Referral of patients with depression to mental health care by Dutch general practitioners: an observational study. *BMC Fam Pract* 2011;**12**:41	GP diagnostic ability and referral
Pileggi C, Carbone V, Pavia M, Angelillo IF. Patient perceptions and related behaviours on role of primary care physician in Italy. Eur J Pub Health 2004;**14**:258–60	Nothing of relevance; outlines why attended GP
Pletcher BA, Rimsza ME, Cull WL, Shipman SA, Shugerman RP, O'Connor KG, *et al.* Primary care pediatricians' satisfaction with subspecialty care, perceived supply, and barriers to care. *J Pediatr* 1015;**156**:1011–15	Relates to views of optimal clinical care rather than referral
Podgorski CA, Lanning BD, Casaceli CJ, Nardi AL, Cox C, Podgorski CA, *et al.* Dementia consults: predictors of compliance by primary care physicians. *Am J Alzheimers Dis Other Demen* 2002;**17**:44–50	Specialist to GP compliance (not GP-specific referral)
Poels PJ, Schermer TR, Thoonen BP, Jacobs JE, Akkermans RP, de Vries Robbe PF, *et al.* Spirometry expert support in family practice: a cluster-randomised trial. *Prim Care Respir J* 2009;**18**:189–97	Improving diagnostic skills of GP rather than referral
Poiraudeau S, Rannou F, Le Henanff A, Coudeyre E, Rozenberg S, Huas D, *et al.* Outcome of subacute low back pain: influence of patients' and rheumatologists' characteristics. *Rheumatology (Oxford)* 2006;**45**:718–23	Predictors of clinical outcomes
Price A, Williams A. Primary care nurse practitioners and the interface with secondary care: a qualitative study of referral practice. *J Interprof Care* 2003;**17**:239–50	Focus on professional roles for clinical care rather than referral
Quinn DC, Graber AL, Elasy TA, Thomas J, Wolff K, Brown A, *et al.* Overcoming turf battles: developing a pragmatic, collaborative model to improve glycaemic control in patients with diabetes. *Jt Comm J Qual Improv* 2001;**27**:255–64	Patient clinical care model rather than referral
Qureshi N, Modell B, Modell M. Timeline – raising the profile of genetics in primary care. *Nature Reviews Genetics* 2004;**5**:783–90	Exclude country (Saudi Arabia)
Rao JK, Kroenke K, Mihaliak KA, Eckert GJ, Weinberger M, Rao JK, *et al.* Can guidelines impact the ordering of magnetic resonance imaging studies by primary care providers for low back pain? *Am J Manag Care* 2002;**8**:27–35	MRI in primary care, not referral
Raymont AM. New Zealand general practitioners' non-urgent referrals to surgeons: who and why? *N Z Med J* 2008;**121**:57–64	General referral data
Redfern J, Bowling A. Efficiency of care at the primary–secondary interface: variations with GP fundholding. *Health Place* 2000;**6**:15–23	Clinical outcomes
Ree MH, Timmerman MF, Wesselink PR. Factors influencing referral for specialist endodontic treatment amongst a group of Dutch general practitioners. *Int Endod J* 2003;**36**:129–34	Dental service
Reinders ME, Blankenstein AH, van Marwijk HW, Schleypen H, Schoonheim PL, Stalman WA, *et al.* Development and feasibility of a patient feedback programme to improve consultation skills in general practice training. *Patient Educ Couns* 2008;**72**:12–19	Improvement of GP trainee skills
Reiss-Brennan B, Briot P, Cannon W, James B. Mental health integration: rethinking practitioner roles in the treatment of depression: the specialist, primary care physicians, and the practice nurse. *Ethn Dis* 2006;**16**(2 Suppl. 3):S3–43	Clinical outcomes of revised case management system
Richards DA, Meakins J, Godfrey L, Tawfik J, Dutton E. Survey of the impact of nurse telephone triage on general practitioner activity. *Br J Gen Pract* 2004;**54**:207–10	Referral within community (nurse to GP)
Ricketts TS. Evaluating the development, implementation and impact of protocols between primary care and specialist mental health services. *J Ment Health* 2003;**12**:369–83	Development of a referral protocol only rather than testing of it
Ridsdale L, Doherty J, McCrone P, Seed P, Clarke L, Das R, *et al.* A new GP with special interest headache service: observational study (Structured abstract). *Br J Gen Pract* 2008;**58**:478–83	Clinical/cost outcomes
Robinson PC, Taylor WJ. Time to treatment in rheumatoid arthritis: factors associated with time to treatment initiation and urgent triage assessment of general practitioner referrals. *J Clin Rheumatol* 2010;**16**:267–73	Patients already referred to secondary care

Full paper excluded	Reason
Roddy E, Zwierska I, Dawes P, Hider SL, Jordan KP, Packham J, *et al.* The Staffordshire arthritis, musculoskeletal, and back assessment (SAMBA) study: a prospective observational study of patient outcome following referral to a primary-secondary care musculoskeletal interface service. *BMC Musculoskelet Disord* 2010;**11**:67	Study protocol. No further papers found in Google search
Rossi PS. Implementation and evaluation of existing guidelines on the use of neurophysiological tests in non-acute migraine patients: a questionnaire survey of neurologists and primary care physicians. *Eur J Neurol* 2009;**16**:937–42	Appropriateness of treatment recommendation GP vs. specialist
Rucci P, Piazza A, Menchetti M, Berardi D, Fioritti A, Mimmi S, *et al.* Integration between primary care and mental health services in Italy: determinants of referral and stepped care. *Int J Fam Med* 2012;**2012**:507464	Care-based outcomes rather than referral outcomes
Russell V, McCauley M, MacMahon J, Casey S, McCullagh H, Begley J. Liaison psychiatry in rural general practice. *Ir J Psychol Med* 2003;**20**:65–8	Discussion paper
Ryan T, Hatfield B, Sharma I. Outcomes of referrals over a six-month period to a mental health gateway team. *J Psychiatr Ment Health Nurs* 2007;**14**:527–34	Analysis of clinical characteristics of referrals that were made to team
Salvador CH, Gonzalez MA, Munoz A, Pascual M. Teleradiology from primary care: comparison of user activity in two different scenarios. *J Telemed Telecare* 2002;**8**:178–82	Quality of teleradiology system, e.g. bandwidth and diagnostics
Sarvet B, Gold J, Straus JH. Bridging the divide between child psychiatry and primary care: the use of telephone consultation within a population-based collaborative system. *Child Adolesc Psychiatr Clin N Am* 2011;**20**:41–53	Description of service rather than empirical data
Saxon AJ, Malte CA, Sloan KL, Baer JS, Calsyn DA, Nichol P, *et al.* Randomized trial of onsite versus referral primary medical care for veterans in addictions treatment (provisional abstract). *Med Care* 2006;**44**:334–42	Treatment options
Scott K. The Swansea electronic referrals project. *J Telemed Telecare* 2009;**15**:156–8	Focuses on ease of use of specific e-referral system. No referral outcomes
Sequist TD. Is referral for colonoscopy overutilized by primary care physicians? *Ann Intern Med* 2006;**145**:654–9	Opinion
Shaw I, Smith KM, Middleton H, Woodward L. A letter of consequence: referral letters from general practitioners to secondary mental health services. *Qual Health Res* 2005;**15**:116–28	Narrative discussion
Sheldon T. Dutch GPs agree to refer fewer patients to hospital and prescribe more generic drugs. *BMJ* 2012;**344**:e4510	General description of service change
Shepherd M. Involving psychologists, counsellors and referrers in the systematic development of consensus-based referral criteria for a primary care psychology and counselling service. *Clin Psychol* 2003;**21**:39–43	Referring within primary care
Shershneva MB, Carnes M, Bakken LL, Shershneva MB, Carnes M, Bakken LL. A model of teaching-learning transactions in generalist-specialist consultations. *J Contin Educ Health Prof* 2006;**26**:222–9	GP training only, not relevant
Short D, Frischer M, Bashford J. Barriers to the adoption of computerised decision support systems in general practice consultations: a qualitative study of GPs' perspectives. *Int J Med Inform* 2004;**73**:357–62	Primary care only, not referral
Shreibati JB, Baker LC. The relationship between low back magnetic resonance imaging, surgery, and spending: impact of physician self-referral status. *Health Serv Res* 2011;**46**:1362–81	Relationship between MRI and surgery
Sifri R, Wender R, Lieberman D, Potter M, Peterson K, Weber TK, *et al.* Developing a quality screening colonoscopy referral system in primary care oractice: a report from the national colorectal cancer roundtable. *CA Cancer J Clin* 2010;**60**:40–9	Discussion/report. References need fully checking
Singh H, Esquivel A, Sittig DF, Murphy D, Kadiyala H, Schiesser R, *et al.* Follow-up actions on electronic referral communication in a multispecialty outpatient setting. *J Gen Intern Med* 2011;**26**:64–9	Audit of discontinued referrals. No intervention
Singh H, Petersen LA, Daci K, Collins C, Khan M, El-Serag HB. Reducing referral delays in colorectal cancer diagnosis: is it about how you ask? *Qual Saf Health Care* 2010;**19**:e27	Clinical factors

Full paper excluded	Reason
Souster V. Learning for primary care practitioners via clinical attachments: the Learning Packages Project. *Work Based Learn Prim Care* 2006;**4**:141–51	Discussion paper
Speed CA, Crisp AJ. Referrals to hospital-based rheumatology and orthopaedic services: seeking direction. *Rheumatology (Oxford)* 2004;**44**:469–71	No intervention, description of content of referral letters
St George I, Cullen M, Gardiner L, Karabatsos G. Universal telenursing triage in Australia and New Zealand – a new primary health service. *Aust Fam Physician* 2008;**37**:476–9	Summary discussion paper
Stanton MR, Atherton WL, Toriello PJ, Hodgson JL. Implementation of a 'learner-driven' curriculum: an screening, brief intervention, and referral to treatment (SBIRT) interdisciplinary primary care model. *Subst Abuse* 2012;**33**:312–15	Commentary. No data
Steele M, Shapiro J, Davidson B, Floyd G, Johnston J, Stretch N, *et al.* Survey comparing criteria used by rural and urban primary care physicians for referrals to child and adolescent psychiatrists and children's mental health agencies in Ontario. *J Can Acad Child Adolesc Psychiatry* 2010;**19**:284–9	Awareness of alternative mental health treatments
Stevens SL, Kinsman SB, Pailler ME, Latif S, Levy SA, Diamond GS. Providers' experiences with identification, management and referral of adolescents with depression. *J Adolesc Health Volume* 2007;**40**(Suppl.):42–3	Diagnosis and clinical care
Stille CJ, McLaughlin TJ, Primack WA, Mazor KM, Wasserman RC. Determinants and impact of generalist-specialist communication about pediatric outpatient referrals. *Pediatrics* 2006;**118**:1341–9	Emphasis on communication for optimal clinical care
Stille CJ, Primack WA, McLaughlin TJ, Wasserman RC. Parents as information intermediaries between primary care and specialty physicians. *Pediatrics* 2007;**120**:1238–46	Communication relating to ongoing care
Street RL Jr. Specialist-primary care provider-patient communication in telemedical consultations. *Telemed J* 2000;**6**:45–54	Looks at the content of telemedical consultations. Not consequences for referral
Sved Williams A, Dodding J, Wilson I, Fuller J, Wade V. Consultation-liaison to general practitioners coming of age: the South Australian psychiatrists' experience. *Australas* 2006;**14**:206–11	
Syed MA, Schofield JK, Kanji A. The challenge of demand management and dermatology referrals: the general practitioner's view. *Br J Dermatol* 2012;**167**:41	Exclude: conference abstract
Tanielian TL. Referrals to psychiatrists: assessing the communication interface between psychiatry and primary care. *Psychosomatics* 2000;**41**:245–52	Describes the referral process rather than managing the process
Taylor KM, Narbey A, McNair A, Foxton M. Screening, referral practice and management of hepatitis B and C in primary care: a survey of general practitioners. *Gut* 2010;**59**:A78	Exclude: conference abstract
Thomas H. Monitoring referrals to mental health services. *Nurs Older People* 2010;**22**:16–22	Epidemiology data and discussion piece
Thong JF, Mok P, Loke D. A quality assurance survey to improve communication between ENT specialists and general practitioners. *Singapore Med J* 2010;**51**:796–9	Letters between hospital ENT and GP rather than primary to secondary
Thornton JD, Chandriani K, Thonton JG, Farooq S, Moallem M, Krishnan V, *et al.* Assessing the prioritization of primary care referrals for polysomnograms. *Sleep* 2010;**33**:1255–60	Compares referral rates for different investigations with emphasis on clinical identification using different investigations
Tjerbo T. Does competition among general practitioners increase or decrease the consumption of specialist health care? *Health Econ Policy Law* 2010;**5**:53–70	Data on spending on specialist care costs rather than referral
Tucker JL. Comparison of specialty referral patterns of primary care providers – practitioner response. *J Healthc Manag* 2002;**47**:205	Clinical outcomes
Turley A, Roberts AP, Kunadian B, Davies A, Rowell N, De Belder MA, *et al.* The impact of the introduction of NT-proBNP into primary care on secondary care referral rates. *Eur Heart J* 2005;**26**:744	Conference abstract

Full paper excluded	Reason
Ung YC, Del Giudice L, Young S, Vella E, Ash M, Bansal P, *et al*. Referral of suspected lung cancer by family physicians and other primary care providers: a clinical practice guideline. *Int J Radiat Oncol Biol Phys* 2012;**84**:S603–4	Exclude: conference abstract
van den Boogaard TM, Verhaak PF, Van Dyck R, Spinhoven P. The impact of causal attributions on diagnosis and successful referral of depressed patients in primary care. *Soc Sci Med* 2011;**73**:1733–40	Factors affecting depression diagnosis
van der Feltz-Cornelis CM, van Oppen P, Adèr HJ, van Dyck R. Randomised controlled trial of a collaborative care model with psychiatric consultation for persistent medically unexplained symptoms in general practice. *Psychother Psychosom* 2006;**75**:282–9	Clinical outcomes
van der Straten LM, van Stel HF, Spee FJ, Vreeburg ME, Schrijvers AJ, Sturms LM. Safety and efficiency of triaging low urgent self-referred patients to a general practitioner at an acute care post: an observational study. *Emerg Med J* 2012;**29**:877–81	Triaging of emergency department patients
van Dam L, van der Togt-van Leeuwen AC, Hol L, Vos CJ, Joung IM, van Ballegooijen M, *et al.* Experiences of general practitioners regarding their role in the referral process for colonoscopy after a positive colorectal cancer screening test. *Gastroenterology* 2010;**138**:S191	Conference abstract
van Dijk CE, Verheij RA, Spreeuwenberg P, Groenewegen PP, de Bakker DH. Minor surgery in general practice and effects on referrals to hospital care: observational study. *BMC Health Serv Res* 2011;**11**:2	Clinical outcomes
Van Schaik P, Flynn D, Van Wersch A, Douglass A, Cann P. The acceptance of a computerised decision-support system: a preliminary investigation. *Behav Inform Technol* 2004;**23**:321–6	Focus on the technology rather than referral process
van Zanten SV. A self help guidebook reduced primary care consultations in irritable bowel syndrome. *Evid Based Med* 2006;**11**:179	Patient education to reduce primary care consultations
Van K, Liu S, Conn L, Hoadley A, Ho S. Improving the effectiveness of fecal occult blood testing in a primary care clinic by direct colonoscopy referral for positive tests. *J Healthc Qual* 2010;**32**:62–9	Effectiveness of test conducted in primary care
Vanden Bussche P, Desmyter F, Duchesnes C, Massart V, Giet D, Petermans J, *et al.* Geriatric day hospital: opportunity or threat? A qualitative exploratory study of the referral behaviour of Belgian general practitioners. *BMC Health Serv Res* 2010;**10**:202	Audit of referral rates – no intervention
Vause J. A recommendation from suspected cancer in primary care: guidance for referral and reducing disparities from the NZ Guidelines Group. *J Prim Health Care* 2009;**1**:144	Short opinion piece
Verstappen WH, van der Weijden T, Dubois WI, Smeele I, Hermsen J, Tan FE, *et al*. Improving test ordering in primary care: the added value of a small-group quality improvement strategy compared with classic feedback only. *Ann Fam Med* 2004;**2**:569–75	Test ordering (blood tests, etc.) not referral
Walker JN, Rourke D, Allen K, Karavitaki N, Levy J, Wass JA, *et al.* An e-mail GP advisory service: a more efficient way of dealing with clinical enquiries. *Br J Hosp Med (Lond)* 2009;**70**:532–3	Clinical queries rather than referral
Wallace P, Haines A, Harrison R, Barber J, Thompson S, Jacklin P, *et al.* Joint teleconsultations (virtual outreach) versus standard outpatient appointments for patients referred by their general practitioner for a specialist opinion: a randomised trial. *Lancet* 2002;**359**:1961–8.	Protocol paper
Walshe C, Chew-Graham C, Todd C, Caress A, Walshe C, Chew-Graham C, *et al.* What influences referrals within community palliative care services? A qualitative case study. *Soc Sci Med* 2008;**67**:137–46	Within-community referrals
Warren J Gu Y, Day K, White S, Pollock M. Electronic referrals: what matters to the users. *Stud Health Technol Informs* 2012;**178**:235–41	Focus on the technology rather than referral process
Watson JM, McDonnell V, Bhaumik S. Valuing people: evaluating referral systems. *Br J Dev Disabil* 2005;**51**:155–70	Exclude: community referrals
Wee S-LK. Improving access to outpatient cardiac care at the National Heart Centre – a partnership between specialists and primary care. *Ann Acad Med Singapore* 2008;**37**:151–7	None OECD country

Full paper excluded	Reason
White DB, Bonham VL, Jenkins J, Stevens N, McBride CM. Too many referrals of low-risk women for BRCA1/2 genetic services by family physicians. *Cancer Epidemiol Biomarkers Prev* 2008;**17**:2980–6	Clinical appropriateness of referral
White P, Singleton A, Jones R. Copying referral letters to patients, views of patients, representatives and doctors. *Patient Educ Couns* 2004;**55**:94–8	Not referral
Wiley-Exley E, Domino ME, Maxwell J, Levkoff SE, Wiley-Exley E, Domino ME, *et al.* Cost-effectiveness of integrated care for elderly depressed patients in the PRISM-E study. *J Ment Health Policy Econ* 2009;**12**:205–13	Compares clinical outcomes for integrated case management to specialty referral
Wilkens JR, Belgrade MJ. Do pain specialists meet the needs of the referring physician? A survey of primary care providers. *J Opioid Manag* 2008;**4**:13–20	Views of drug management
Wilkes S, Rubin G, Crosland A, Hall N, Murdoch A. Patient and professional views of open access hysterosalpingography for the initial management of infertility in primary care. *Br J Gen Pract* 2009;**59**:336–42	Views of GPs towards infertility treatment; pre-testing as part of referral process rather than managing demand
Wilson BJ, Torrance N, Mollison J, Watson MS, Douglas A, Miedzybrodzka Z, *et al.* Cluster randomized trial of a multifaceted primary care decision-support intervention for inherited breast cancer risk. *Fam Pract* 2006;**23**:537–44	Primary care only
Wong WM, Beeler J, Risner-Adler S, Habib S, Bautista J, Fass R. Attitudes and referral patterns of primary care physicians when evaluating subjects with noncardiac chest pain – a national survey. *Dig Dis Sci* 2005;**50**:656–61	Diagnosis and clinical care emphasis
Worrall SF. An audit of general dental practitioners' referral practice following the distribution of third molar guidelines. *Ann R Coll Surg Engl* 2001;**83**:61–4	Not hospital care
Xibillé-Friedmann D, Mondragón-Flores V, Horcasitas de la Rosa C. Criteria used by primary care physicians for the diagnosis and referral to a rheumatologist of patients with rheumatoid arthritis. *Reumatologia Clinica* 2006;**2**:235–8	Clinical outcomes
Yafi FA, Aprikian AG, Tanguay S, Kassouf W. Patients with microscopic and gross hematuria: practice and referral patterns among primary care physicians in a universal health care system. *Can Urol Assoc J* 2011;**5**:97–101	Clinical knowledge of physicians
Yardley L, Kirby S, Barker F, Little P, Raftery J, King D, *et al.* An evaluation of the cost-effectiveness of booklet-based self-management of dizziness in primary care, with and without expert telephone support. *BMC Ear Nose Throat Dis* 2009;**9**:13	Study protocol only Outcomes paper has clinical data only, nothing on referrals: www.ncbi.nlm.nih.gov/pubmed/22674920?dopt=Abstract
Zanjani F, Miller B, Turiano N, Ross J, Oslin DE-MA, Zanjani F. Effectiveness of telephone-based referral care management, a brief intervention to improve psychiatric treatment engagement. *Psychiatr Serv* 2008;**59**:776–81	Looks at alternative treatment, not referral

Appendix 6 Systematic review papers

Alvarez MP, Agra Y. Systematic review of educational interventions in palliative care for primary care physicians. *Palliat Med* 2006;**20**:673–83.

Bazian Ltd. Specialist outreach into primary care: is it better than standard care? *Evid-Based Healthc Public Health* 2005;**9**:294–301.

Bower P, Sibbald B. Systematic review of the effect of on-site mental health professionals on the clinical behaviour of general practitioners. *BMJ* 2000;**320**:614–17.

Bower P, Sibbald B. Do consultation-liaison services change the behaviour of primary care providers? A review. *General Hospital Psychiatry* 2000;**22**:84–96.

Brocklehurst PR, Baker SR, Speight PM. Primary care clinicians and the detection and referral of potentially malignant disorders in the mouth: a summary of the current evidence. *Prim Dent* Care 2010;**17**:65–71.

Cardiff University, CRG Research Ltd. *Evaluation of Referral Management Pilots in Wales*. NHS Wales and National Leadership and Innovation Agency for Healthcare; 2006.

CRG Research Ltd, Cardiff University. *Referral Management Pilots in Wales – Follow Up Review*. National Leadership and Innovation Agency for Healthcare; 2007.

Clarke A, Blundell N, Forde I, Musila N, Spitzer D, Naqvi S, *et al.* Can guidelines improve referral to elective surgical specialties for adults: a systematic review. *Qual Saf Health Care* 2008;**19**:187–94.

Delva F, Soubeyran P, Rainfray M, Mathoulin-Pelissier S. Referral of elderly cancer patients to specialists: action proposals for general practitioners. *Cancer Treat Rev* 2012;**38**:935–41.

Foot C, Naylor C, Imison C. *The Quality of GP Diagnosis and Referral*. London: The King's Fund; 2010.

Forrest CB. Primary care gatekeeping and referrals: effective filter of failed experiment? *BMJ* 2003;**326**:692–5.

Gruen RL, Weeramanthri TS, Knight SS, Bailie RS. Specialist outreach clinics in primary care and rural hospital settings. *Cochrane Database Syst Rev* 2003;**4**:CD003798.

Harkness EF, Bower PJ. On site mental health workers delivering psychological therapy and psychosocial interventions to patients in primary care: effects on the professional practice of primary care providers. *Cochrane Database Syst Rev* 2009;**1**:CD000532.

Herrington P, Baker R, Gibson SL, Golden S. GP referrals for counselling: a review and model. *J Interprof Care* 2003;**17**:263–71.

Jiwa M, Dadich A. Referral letter content: can it affect patient outcomes? *Br J Health Care Manage* 2013;19:140–7.

Lin CY. Improving care coordination in the specialty referral process between primary and specialty care. *NC Med J* 2012;**73**:61–2.

Martin A, Macleod C, Naqui SAR. *Effectiveness and Cost-Effectiveness of Targeted Interventions to Reduce Unnecessary Referrals and Improve the Quality of Referrals from Primary Care to Secondary Care.* NHS Evidence Adoption Centre East of England; 2010.

Mead N, Bower P. Patient centred consultations and outcomes in primary care: a review of the literature. *Patient Educ Couns* 2002;**48**:51–61.

Mehrota A, Forrest CB, Lin CY. Dropping the baton: specialty referrals in the United States. *Millbank Q* 2011;**89**:39–68.

Navaneethan SD, Aloudat S, Singh S. A systematic review of patient and health system characteristics associated with late referral in chronic kidney disease. *BMC Nephrology* 2008;**9**.

O'Donnell CA. Variation in GP referral rates: what can we learn from the literature? *Fam Pract* 2000;**17**:462–71.

Piterman L, Koritsas S. Part II General practitioner-specialist referral process. *Intern Med J* 2005;**35**:491–6.

Powell J. Systematic review of outreach clinics in primary care in the UK. *J Health Serv Res Policy* 2007;**7**:177–83.

Qureshi NA, van der Molen HT, Schmidt HG, Al-Habeeb TA, Magzoub MEM. Criteria for a good referral system for psychiatric patients: the view from Saudi Arabia. *East Mediterr Health J* 2009;**15**:1580–95.

Roland M, McDonald R, Sibbald B, Boyd A, Fotaki M, Gravelle H, *et al. Outpatient Services and Primary Care: A Scoping Review of Research into Strategies for Improving Outpatient Effectiveness and Efficiency*. National Primary Care Research and Development Centre, and Centre for Public Policy and Management of the University of Manchester; 2006.

Review studies quality assessment

Assessment checklist:

1. The study has a clear research question and defined inclusion/exclusion criteria.
2. There is evidence of a substantial effort to identify all relevant research across several sources.
3. Appropriate methods were used to minimise reviewer error or bias in study selection, extraction and quality appraisal.
4. Validity of included studies was adequately assessed.
5. Sufficient detail for individual studies was provided.
6. The studies were summarised appropriately.
7. The authors' conclusion was an accurate reflection of the evidence presented.

Lower risk of bias: all or nearly all of the checklist criteria have been fulfilled.

Higher risk of bias: some of the checklist criteria have been fulfilled.

Not clear: unable to make an assessment due to lack of detail in the paper.

Quality assessment of review papers

Study	Checklist item 1	2	3	4	5	6	7	Rating
Akbari *et al.* 2008[1]	✓	✓	✓	✓	✓	✓	✓	Lower risk of bias
Alvarez and Agra 2006[312]	✓	✓	Unclear	Unclear	✓	✓	✓	Lower risk of bias
Bazian Ltd 2005[313]	✓	✗	Unclear	Unclear	✓	✓	✓	Lower risk of bias
Bower and Sibbald 2000[314]	✓	✓	✓	✓	✓	✓	✓	Lower risk of bias
Bower and Sibbald 2000[315]	✓	✓	Unclear	Unclear	✓	✓	✓	Lower risk of bias
Brocklehurst *et al.* 2010[316]	✗	✗	Unclear	Unclear	✗	✗	✓	Higher risk of bias
CRG Research and Cardiff University 2006[317]	✗	✗	Unclear	Unclear	✗	✗	Unclear	Higher risk of bias
CRG Research and Cardiff University 2007[318]	✗	✗	Unclear	Unclear	✗	✗	✓	Higher risk of bias
Clarke *et al.* 2010[319]	✓	✓	✓	✓	✓	✓	✓	Lower risk of bias
Delva *et al.* 2012[320]	✓	✗	✓	✓	✗	✗	✓	Lower risk of bias
Dunst and Gorman 2006[3]	✓	✓	✓	✓	✗	✗	✓	Lower risk of bias
Faulkner *et al.* 2003[2]	✓	✓	✓	✓	✓	✓	✓	Lower risk of bias
Foot *et al.* 2010[321]	✓	✓	Unclear	Unclear	✗	✗	✓	Higher risk of bias
Forrest 2003[322]	✗	✗	Unclear	Unclear	✗	✗	Unclear	Higher risk of bias
Grimshaw *et al.* 2005[4]	✓	✓	✓	✓	✓	✓	✓	Lower risk of bias
Gruen *et al.* 2003[323]	✓	✓	✓	✓	✓	✓	✓	Lower risk of bias
Harkness and Bower 2009[324]	✓	✓	✓	✓	✓	✓	✓	Lower risk of bias
Herrington *et al.* 2003[325]	✗	✓	Unclear	Unclear	✗	✗	✓	Higher risk of bias
Imison and Naylor 2010[5]	✓	✓	Unclear	Unclear	✗	✗	✓	Higher risk of bias
Jiwa and Dadich 2013[326]	✗	✗	Unclear	Unclear	✗	✗	✓	Higher risk of bias
Lin 2012[327]	✗	✗	Unclear	Unclear	✗	✗	Unclear	Higher risk of bias
Martin *et al.* 2010[328]	✓	✗	✓	✓	✓	✓	✓	Lower risk of bias
Mead and Bower 2002[329]	✓	✓	Unclear	✓	✓	✓	✓	Lower risk of bias
Mehrota *et al.* 2011[330]	✗	✗	Unclear	Unclear	✗	✗	✓	Higher risk of bias
Navaneethan *et al.* 2008[331]	✓	✓	✓	Unclear	✓	✓	✓	Lower risk of bias
O'Donnell 2000[332]	✗	✗	Unclear	Unclear	✗	✓	✓	Higher risk of bias
Piterman and Koritsas 2005[333]	✗	✗	Unclear	Unclear	✗	✗	✓	Higher risk of bias
Powell 2002[334]	✓	✓	Unclear	Unclear	✓	✓	✓	Lower risk of bias
Qureshi *et al.* 2009[335]	✗	✗	Unclear	Unclear	✗	✗	Unclear	Higher risk of bias
Roland *et al.* 2006[336]	✓	✓	✓	Unclear	✓	✓	✓	Lower risk of bias

EME
HS&DR
HTA
PGfAR
PHR

Part of the NIHR Journals Library
www.journalslibrary.nihr.ac.uk

Published by the NIHR Journals Library