

Communication of carrier status information following universal newborn screening for sickle cell disorders and cystic fibrosis: qualitative study of experience and practice

J Kai, F Ulph, T Cullinan and N Qureshi



November 2009
DOI: 10.3310/hta13570

Health Technology Assessment
NIHR HTA programme
www.hta.ac.uk





How to obtain copies of this and other HTA programme reports

An electronic version of this publication, in Adobe Acrobat format, is available for downloading free of charge for personal use from the HTA website (www.hta.ac.uk). A fully searchable CD-ROM is also available (see below).

Printed copies of HTA monographs cost £20 each (post and packing free in the UK) to both public **and** private sector purchasers from our Despatch Agents.

Non-UK purchasers will have to pay a small fee for post and packing. For European countries the cost is £2 per monograph and for the rest of the world £3 per monograph.

You can order HTA monographs from our Despatch Agents:

- fax (with **credit card** or **official purchase order**)
- post (with **credit card** or **official purchase order** or **cheque**)
- phone during office hours (**credit card** only).

Additionally the HTA website allows you **either** to pay securely by credit card **or** to print out your order and then post or fax it.

Contact details are as follows:

HTA Despatch
Magellan
Concept House, Bell Road
Basingstoke, Hants RG24 8FB, UK

Email: orders@hta.ac.uk
Tel: 02392 492 000
Fax: 02392 478 555
Fax from outside the UK: +44 2392 478 555

NHS libraries can subscribe free of charge. Public libraries can subscribe at a very reduced cost of £100 for each volume (normally comprising 30–40 titles). The commercial subscription rate is £300 per volume. Please see our website for details. Subscriptions can be purchased only for the current or forthcoming volume.

Payment methods

Paying by cheque

If you pay by cheque, the cheque must be in **pounds sterling**, made payable to *Direct Mail Works Ltd* and drawn on a bank with a UK address.

Paying by credit card

The following cards are accepted by phone, fax, post or via the website ordering pages: Delta, Eurocard, Mastercard, Solo, Switch and Visa. We advise against sending credit card details in a plain email.

Paying by official purchase order

You can post or fax these, but they must be from public bodies (i.e. NHS or universities) within the UK. We cannot at present accept purchase orders from commercial companies or from outside the UK.

How do I get a copy of HTA on CD?

Please use the form on the HTA website (www.hta.ac.uk/htacd.htm). Or contact Direct Mail Works (see contact details above) by email, post, fax or phone. *HTA on CD* is currently free of charge worldwide.

The website also provides information about the HTA programme and lists the membership of the various committees.

Communication of carrier status information following universal newborn screening for sickle cell disorders and cystic fibrosis: qualitative study of experience and practice

J Kai*, F Ulph, T Cullinan and N Qureshi

Division of Primary Care, School of Graduate Medicine & Health, University of Nottingham, Nottingham, UK

*Corresponding author

Declared competing interests of authors: none

Published November 2009

DOI: 10.3310/hta13570

This report should be referenced as follows:

Kai J, Ulph F, Cullinan T, Qureshi N. Communication of carrier status information following universal newborn screening for sickle cell disorders and cystic fibrosis: qualitative study of experience and practice. *Health Technol Assess* 2009;**13**(57).

Health Technology Assessment is indexed and abstracted in *Index Medicus/MEDLINE*, *Excerpta Medica/EMBASE*, *Science Citation Index Expanded (SciSearch®)* and *Current Contents®/Clinical Medicine*.

NIHR Health Technology Assessment programme

The Health Technology Assessment (HTA) programme, part of the National Institute for Health Research (NIHR), was set up in 1993. It produces high-quality research information on the effectiveness, costs and broader impact of health technologies for those who use, manage and provide care in the NHS. 'Health technologies' are broadly defined as all interventions used to promote health, prevent and treat disease, and improve rehabilitation and long-term care.

The research findings from the HTA programme directly influence decision-making bodies such as the National Institute for Health and Clinical Excellence (NICE) and the National Screening Committee (NSC). HTA findings also help to improve the quality of clinical practice in the NHS indirectly in that they form a key component of the 'National Knowledge Service'.

The HTA programme is needed in that it fills gaps in the evidence needed by the NHS. There are three routes to the start of projects.

First is the commissioned route. Suggestions for research are actively sought from people working in the NHS, from the public and consumer groups and from professional bodies such as royal colleges and NHS trusts. These suggestions are carefully prioritised by panels of independent experts (including NHS service users). The HTA programme then commissions the research by competitive tender.

Second, the HTA programme provides grants for clinical trials for researchers who identify research questions. These are assessed for importance to patients and the NHS, and scientific rigour.

Third, through its Technology Assessment Report (TAR) call-off contract, the HTA programme commissions bespoke reports, principally for NICE, but also for other policy-makers. TARs bring together evidence on the value of specific technologies.

Some HTA research projects, including TARs, may take only months, others need several years. They can cost from as little as £40,000 to over £1 million, and may involve synthesising existing evidence, undertaking a trial, or other research collecting new data to answer a research problem.

The final reports from HTA projects are peer reviewed by a number of independent expert referees before publication in the widely read journal series *Health Technology Assessment*.

Criteria for inclusion in the HTA journal series

Reports are published in the HTA journal series if (1) they have resulted from work for the HTA programme, and (2) they are of a sufficiently high scientific quality as assessed by the referees and editors.

Reviews in *Health Technology Assessment* are termed 'systematic' when the account of the search, appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.

The research reported in this issue of the journal was commissioned by the HTA programme as project number 04/10/01. The contractual start date was in May 2006. The draft report began editorial review in February 2009 and was accepted for publication in July 2009. As the funder, by devising a commissioning brief, the HTA programme specified the research question and study design. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors' report and would like to thank the referees for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this report.

The views expressed in this publication are those of the authors and not necessarily those of the HTA programme or the Department of Health.

Editor-in-Chief:

Professor Tom Walley CBE

Series Editors:

Dr Aileen Clarke, Professor Chris Hyde, Dr John Powell,

Dr Rob Riemsma and Professor Ken Stein

ISSN 1366-5278

© 2009 Queen's Printer and Controller of HMSO

This monograph may be freely reproduced for the purposes of private research and study and may be included in professional journals provided that suitable acknowledgement is made and the reproduction is not associated with any form of advertising.

Applications for commercial reproduction should be addressed to: NETSCC, Health Technology Assessment, Alpha House, University of Southampton Science Park, Southampton SO16 7NS, UK.

Published by Prepress Projects Ltd, Perth, Scotland (www.prepress-projects.co.uk), on behalf of NETSCC, HTA.

Printed on acid-free paper in the UK by Henry Ling Ltd, The Dorset Press, Dorchester.



Abstract

Communication of carrier status information following universal newborn screening for sickle cell disorders and cystic fibrosis: qualitative study of experience and practice

J Kai*, F Ulph, T Cullinan and N Qureshi

Division of Primary Care, School of Graduate Medicine & Health, University of Nottingham, Nottingham, UK

*Corresponding author

Objectives: To describe and explore current practice, methods and experience of communicating carrier status information following newborn screening for cystic fibrosis (CF) and sickle cell (SC) disorders, to inform practice and further research.

Design: Three linked qualitative studies.

Setting: All nine health regions in England.

Participants: Child health screening co-ordinators in all English health regions, health professionals communicating results to parents and parents of newborn carriers.

Methods: A preliminary phase of semi-structured telephone interviews with child health screening co-ordinators in all nine English health regions, and thematic analysis of data; semi-structured face-to-face interviews with purposeful samples of 67 family members of 51 infants identified by universal newborn screening as carriers of CF or SC with data analysis by constant comparison; and semi-structured telephone interviews, and focus groups, with a key informant sample of 16 differing health professionals currently tasked with communicating results to parents in a range of ways, with thematic analysis of data.

Results: Methods for and respondents' experiences of communication of carrier results varied considerably within and between regions, and within and between SC and CF contexts. Approaches ranged from letter or telephone call alone, to in-person communication in the clinic or at home, with health professionals from haemoglobinopathy, CF, screening and genetics backgrounds, or from community and primary care, such as health visitors with SC carrier results. Health professionals identified pros and cons of different methods, preferring opportunity for face-to-face communication with parents where possible, particularly for CF carrier results. They were concerned

by regional variations in protocols, the lack of availability of translated information on SC carrier results, and the feasibility of sustaining more 'specialist' involvement at current levels, particularly for SC carriers. Parents were often poorly prepared for the possibility of a newborn carrier result. Some had felt overloaded by screening information received during pregnancy or prior to newborn screening, or found this information failed to meet their needs. Opportunity for face-to-face communication of results was valued by parents of SC carriers and appeared particularly necessary for those without prior knowledge of SC carrier status or where English was not their first language. Indirect communication of results by letter appeared effective and feasible for parents more aware of SC carrier status from antenatal or earlier experience, and where this communication contained an unambiguous opening statement emphasising 'your child is not ill'. Face-to-face communication of CF carrier results by professionals with screening, CF or genetics backgrounds worked well for parents, but communication and information was crucially lacking at the earlier stage of repeat blood spot testing, creating considerable distress among half of respondents. Respondents had no particular preference for the type of health professional who communicated results to them, as long as they were well informed and could answer their queries. Parents regarded carrier results as valuable information gained fortuitously.

Conclusions: Methods of communication of newborn carrier results vary considerably across England. Parents' needs for timely and appropriate information may not be met consistently or adequately. Respondents' experiences suggest a need for greater recognition of communication with individuals occurring across a screening pathway, rather than as a discrete event.



Contents

Glossary and list of abbreviations	vii	6 Discussion	43
Executive summary	xiii	Summary of main findings	43
1 Introduction	1	Strengths and limitations	43
Newborn screening and carrier identification	1	Comparison with existing evidence: what does this study add?	45
Sickle cell and cystic fibrosis newborn carrier identification: key differences	3	Communication of newborn sickle cell carrier results	45
Communication of carrier results following newborn screening	3	Communication of newborn cystic fibrosis screening results	45
Communication of carrier results following newborn screening: current evidence ...	5	Health professionals involved in communicating information	46
Rationale for current study	7	Preparedness for results of newborn screening	46
2 Aims, objectives and overview	9	Content of communication	46
Aims	9	Implications for health care	46
Objectives	9	Considering information available to support screening	48
Methods	9	Guidance for health professionals	50
3 Current or proposed models of communicating newborn carrier information: regional screening co-ordinator perspectives	11	Research recommendations	53
Background	11	Acknowledgements	57
Methods	11	References	59
Results	11	Appendix 1 Communication of newborn carrier results: summary of primary studies that include relevant data	65
4 Views and experiences of health professionals communicating results	17	Appendix 2 HTA 04/10 Disclosing carrier status information following newborn screening	75
Objective	17	Health Technology Assessment reports published to date	83
Methods	17	Health Technology Assessment programme	103
Results	17		
5 Views and experiences of parents receiving carrier results	23		
Objectives	23		
Methods	23		
Results	24		





Glossary and list of abbreviations

Glossary

Antenatal Happening or existing before birth. Term applied to services provided to pregnant women (e.g. antenatal clinic, antenatal screening).

APoGI The Accessible Publishing of Genetic Information group aims to provide health professionals with an internet resource to help equip them for counselling and advice on haemoglobin disorders, and provide written information for patients.

At risk' couple A couple with a known potential to have children with a specific disorder – e.g. in each pregnancy, a couple who both carry haemoglobin S have a one in four risk of a child with sickle cell anaemia.

At risk' person In medical genetics, a healthy person who may develop a genetic disorder in the future, or may have children with a genetic disorder – i.e. a person with a known personal or reproductive genetic risk, or both.

Autosome A chromosome other than a sex chromosome. Human beings have 22 pairs of autosomes and two sex chromosomes (total 46 chromosomes).

Autosomal Adjective applied (a) to any gene on an autosome, and (b) to the inheritance patterns of conditions caused by autosomal gene variants – autosomal dominant and autosomal recessive inheritance patterns. The term excludes X-linked and mitochondrial inheritance.

Autosomal recessive Describes a situation in which the carrier of an altered gene does not show any characteristics of the disorder. The baby of two carriers of the altered gene has a 25% chance of inheriting the disorder.

Carrier (of a gene variant) A healthy person with one usual and one variant copy of a specific gene. A healthy carrier. A heterozygote.

Carrier diagnosis The tests involved in reaching the definite conclusion that a person does or does not carry a specific inherited disorder. For haemoglobin disorders, a definitive carrier diagnosis is usually reached by measurement of the red cell indices plus high performance liquid chromatography or its equivalent, although additional tests, including DNA tests, are sometimes required.

Carrier testing Testing a person known to be at increased risk of carrying a specific inherited disorder (e.g. because a relative is affected or a known carrier) to exclude or confirm carrier status for that disorder.

Cystic fibrosis The commonest recessively inherited disorder of North Europeans. It is due to variants of the cystic fibrosis transmembrane regulator protein, which controls salt transport in glands in the lungs and intestines, and in sweat glands. Cystic fibrosis causes accumulation of thickened secretions which impede the normal functioning of the lungs, the digestive system and the reproductive system. It is managed by intensive daily physiotherapy and regular antibiotic treatment. Most patients survive past their 30s and survival is improving steadily with progress in treatment. A national newborn screening programme exists to detect cystic fibrosis.

Cascade screening Term often used to describe the offer of genetic testing to relatives of a person with a genetic diagnosis. Prefer: cascade testing.

Cascade testing Offering carrier testing to the relatives of a person who has, or carries, an inherited disorder. This is usually carried out in collaboration with the presenting patient or, in the case of children, with their parents. The first step is to take a genetic family history in order to identify relatives who may be carriers. These may then be contacted, informed of their risk and offered testing.

continued

Child health record database An electronic database in which selected information is recorded for every baby born, including the results of newborn screening tests. The objective is to keep a record of 'at risk' infants for surveillance. The child health record is available to health workers with responsibility for the safety of infants and young children, including paediatricians, health visitors and general practitioners. Note: 'child health record' may sometimes also be used to refer to *parent held paper* child health records of routine health data such as weight and immunisations.

Chromosome A long thread of double-stranded DNA combined with complex proteins. Human beings have 46 chromosomes in the nucleus of each cell – 22 pairs of autosomes and one pair of sex chromosomes. Genes are arranged in a specific sequence along the chromosomes.

Disorder A disturbance of the normal state of the body or mind. A physical or mental illness, a chronic disease [*Oxford English Dictionary*].

DNA test/analysis It is usually possible to detect the presence of the common medically significant haemoglobin variants by simple laboratory techniques and to identify them with sufficient accuracy for clinical purposes. On the rare occasions when the precise amino acid structure or DNA mutation is required, detailed protein or DNA analysis must be undertaken.

Ethnic diversity Range of cultural, social and religious variety associated with different ethnic origins within a population.

Ethnic group Broadly, a racial, national, religious or cultural group, or any combination of these.

False positive Some women are told that tests have shown that their baby may have a problem. If further tests then show that this is not the case, that result is called a false positive.

Family history A medical family history is an enquiry about illnesses and causes of death in blood relatives of a patient. A positive family history refers to the presence of a particular disorder in one or more blood relatives. Such a disorder is not necessarily genetic. A family history may be found with some infectious diseases (e.g. tuberculosis), disorders related

to smoking, diet or occupation, or genetically determined conditions.

Gene A unit of heredity that is passed from parents to offspring through the gametes (eggs and sperm). This is Mendel's original definition. It is now known that a gene is a section of DNA with a specific sequence that codes for a specific protein or protein subunit, or an RNA sequence. Human beings have 20,000–30,000 pairs of genes.

Gene alteration Any change or difference in the usual makeup or function of a gene, including a modification in the formation of proteins.

Gene variant An inherited difference from the usual (canonical or 'wild type') DNA sequence of a gene. Variants occur in both the coding and the non-coding DNA segments of genes. Most gene variants simply contribute to human diversity, but some can cause an inherited disorder.

Genetics The study of heredity and variation.

Genetic counselling Explaining genetic information to people, and supporting them in making their own decisions on the basis of this information.

Genetic counsellor A health professional with specialised training in genetics and counselling who can provide information and support to people and families with a known genetic risk or genetic disorder.

Genetic disorder Any disorder caused by variation in the hereditary material. The term includes chromosomal disorders, single gene disorders, and disorders due to the interaction of genetic predisposition with other factors (multifactorial disorders).

Haemoglobin The protein in red blood cells that picks up oxygen in the lungs and releases it in other parts of the body. Each haemoglobin molecule is made up of four globin chains, all carrying one haem molecule. Haemoglobin makes up 80% of red blood cells (excluding water).

Haemoglobin disorders An illness caused by altered structure, or reduced production of any of the components of haemoglobin. In principle,

the term covers acquired disorders (iron deficiency, lead poisoning) as well as inherited disorders of haem or globin production. In practice, it is used almost exclusively for inherited disorders of globin production. The main groups of haemoglobin disorders are sickle cell disorders and the thalassaemias, but other rare disorders caused by unstable or high or low oxygen affinity haemoglobin also occur.

Haemoglobinopathies Collective term for disorders due to globin gene variants, including thalassaemias, sickle cell disorders, and disorders due to unstable haemoglobins or low or high oxygen affinity haemoglobins. The term covers molecular and clinical aspects and can be applied to carriers and people with clinical disorders.

Haemoglobin (gene) variant An unusual form of one of the globin genes. A useful collective term that includes unusual haemoglobins, thalassaemias and rarer genetic variants.

Heel prick test/newborn blood spot test A test offered for all newborn babies to detect those with selected disorders for which early diagnosis improves their outlook. In the UK, the test is provided for phenylketonuria, congenital hypothyroidism, sickle cell disorders and cystic fibrosis. Drops of blood obtained by puncturing the baby's heel are collected onto filter paper and sent to the laboratory for testing.

High risk Screening usually divides a population into a low risk group and a group at increased (high) risk. The level of risk covered by the term high risk varies widely. In antenatal screening, a woman is considered to be at increased risk for Down's syndrome if there is a more than 1 in 250 chance the fetus is affected; a woman who carries a haemoglobin gene variant is considered to be at high risk until her partner is shown not to be a carrier; carrier couples with a one in four risk of an affected fetus in each pregnancy are considered to be at very high risk.

Immunoreactive trypsinogen Measurement of immunoreactive trypsinogen (IRT) concentration in dried blood spots is the most common technique for cystic fibrosis (CF) neonatal screening. Given that a considerable number of newborns show raised IRT levels, the screening specificity is often improved by determining whether infants

with hypertrypsinemia have the most common CF mutations: diagnosis is established in neonates carrying two mutations, but a sweat test is required if only one mutation is found, to distinguish between affected individuals – who would have a second, unrecognised mutation – and heterozygotes. Infants with raised IRT, one CF mutation, and normal sweat electrolyte concentrations are usually considered to be carriers only.

Inherited Passed on from parent to child.

National Screening Committee The UK National Screening Committee is a national advisory body that makes recommendations about screening for the Department of Health.

PEGASUS Professional Education for Genetic Assessment and Screening (PEGASUS), a programme funded by the NHS Sickle Cell & Thalassaemia Screening Programme to develop education and training support for health professionals involved in antenatal and newborn screening (www.pegasus.nhs.uk).

Prevalence The proportion of a population who have a given condition at any one time. For example the prevalence of carriers of beta thalassaemia in Cyprus is 17%.

High prevalence area Term used in the context of screening for disorders that are not evenly distributed among the population. In the context of screening for haemoglobin disorders, a part of the country where there are many members of groups at increased risk. In the context of the UK Sickle Cell & Thalassaemia Screening Programme, a part of the country having an estimated birth prevalence of sickle cell disorders of 1.5 or more per 10,000 births. This level is considered sufficiently high to justify universal antenatal screening.

Low prevalence area A part of a country where there are relatively few members of specific groups (e.g. target groups for a screening programme). The UK Sickle Cell & Thalassaemia Screening Programme defines a low prevalence area as a part of the UK where the estimated prevalence of sickle cell disorders is less than 1.5 per 10,000 births. This is considered too low a level to justify universal antenatal screening.

continued

Residual risk The level of uncontrolled risk remaining after all cost-effective actions have been taken to lessen the effect and probability of a specific risk.

Screening The offer of a simple test to a defined population, to identify individuals who are at increased risk of developing a specific disorder themselves, and/or at risk of having affected children. A screening test usually divides a population into a group at low risk for whom no further action is indicated, and a group at increased (or high) risk. The latter may then be offered further tests to reach a definitive diagnosis. In principle, a resolution of the concern raised by a 'high risk' screening result should be achieved in all cases.

Antenatal screening A test offered to all pregnant women, as early in pregnancy as possible, to identify those at increased risk of having a child with a specific disorder.

Newborn screening A test offered routinely for all babies at birth, or in the first few days after birth. Also called neonatal screening.

Screen negative Term often used for the result of a screening test that places a person in a low risk group.

Screen positive (positive result) Term often used for the result of a screening test that places a person in the group at increased (high) risk.

Screening pathway The entire sequence of steps involved in a screening strategy, starting with the first screening test and ending with a definitive diagnosis. The number of steps involved varies considerably. Antenatal screening for Down's syndrome involves two main steps: (1) screening pregnant women for risk of an affected fetus and (2) offering prenatal diagnosis to those with a computed risk above 1 in 250. Screening for risk

of haemoglobin disorders can involve up to five steps, and is sometimes described as a screening cascade.

Screening programme A system for providing screening for a specific condition or a group of conditions equitably to a defined population.

Sickle cell carrier Person with one usual copy of the beta globin gene and one beta S gene variant. Carriers of haemoglobin S have no or very few health problems due to carrying haemoglobin S, and have considerable protection against severe illness due to falciparum malaria.

Sickle cell disorders A group of inherited disorders that are characterised by sickling of red blood cells when there is a shortage of oxygen. The commonest sickle cell disorders are sickle cell anaemia, haemoglobin SC disorder, haemoglobin SD Punjab disorder and haemoglobin S/beta thalassaemia, and some other rare combinations. Sickle cell disorders can cause anaemia, increased risk of infections, chest problems and painful crises (unpredictable attacks of very severe pain that can occur anywhere in the body). They can be life-threatening, particularly for young children.

Thalassaemia An inherited condition in which a reduced amount of globin (and so of haemoglobin) is present in each red blood cell. There are two main types depending on the globin gene involved: the alpha thalassaemias and the beta thalassaemias. People who carry thalassaemia are usually healthy, but people who inherit two alpha or two beta thalassaemia variants may have a serious haemoglobin disorder.

Variant One of two or more persons or things exhibiting usually slight differences [*Oxford English Dictionary*].

List of abbreviations

ApoGI	The Accessible Publishing of Genetic Information	PEGASUS	Professional Education for Genetic Assessment and Screening
CF	cystic fibrosis	R&D	research and development
Hb	haemoglobin	SC	sickle cell
HTA	Health Technology Assessment	UKNSPC	UK Newborn Screening Programme Centre
IRT	immunoreactive trypsinogen		
NSC	National Screening Committee		

All abbreviations that have been used in this report are listed here unless the abbreviation is well known (e.g. NHS), or it has been used only once, or it is a non-standard abbreviation used only in figures/tables/appendices, in which case the abbreviation is defined in the figure legend or in the notes at the end of the table.



Executive summary

Background

Universal newborn screening for sickle cell (SC) disorders and cystic fibrosis (CF) has recently been implemented across England as part of the NHS newborn blood spot (heel prick) programme. The aim is early identification and treatment of babies affected by these disorders, but screening can also identify infants who are healthy carriers of the conditions.

Differences between newborn screening for SC and CF are that identification of newborn SC carriers is relatively common while identification of newborn CF carriers is rare. Also, antenatal carrier screening for SC means parents may be more prepared for the possibility of their newborn being a carrier, and this clear result is available following the newborn blood spot alone. A two-stage screening process for CF means parents experience the newborn blood spot, an initial result suggesting increased risk of CF, with need for a second blood spot sample, before being later informed their child is a carrier. Apparent carriers of CF also have a small residual risk of being affected with CF.

Knowledge of a child's carrier status and its implications may be helpful as this can have reproductive implications for the child, parents, and their wider family. Parents of infants identified as carriers must be informed of their baby's result. However there is a lack of knowledge of current practice nationally, and lack of evidence internationally to inform the most effective ways of doing so, in particular from parents' experiences.

Objectives

The study aimed to describe and explore current practice, methods and experience of communicating carrier status information following newborn screening for CF and SC disorders, to inform practice and further research. The study sought to address the following questions:

- What is current practice for communicating carrier status information following newborn screening for SC disorders and CF in England?
- What are the views of health professionals communicating carrier status information on acceptability, feasibility, and effectiveness of methods for informing parents?
- What are parents' experiences and views of how they are informed and the support they are offered?
- How well is carrier status information understood by parents?
- What is the impact on a family of being informed of newborn carrier status?
- What can we learn from existing evidence and current practice and experience about effectiveness and feasibility of methods for communicating carrier status information, and what further research is required?

Methods

A qualitative study across England using (1) a preliminary phase of semi-structured telephone interviews with child health screening co-ordinators in all nine English health regions, and thematic analysis of data; (2) semi-structured face-to-face interviews with purposeful samples of 67 family members (49 mothers, 16 fathers, 2 grandparents) of 51 infants identified by universal newborn screening as carriers of CF ($n = 27$) and SC ($n = 24$), with experience of carrier status information communicated by a range of different methods in localities across England, with data analysis by constant comparison, and subsequent respondent validation; and (3) semi-structured telephone interviews, and focus groups, with a key informant sample of 16 differing health professionals currently tasked with communicating results to parents in a range of ways, with thematic analysis of data. In parallel, existing evidence was reviewed, focusing on methods of communicating newborn carrier information.

Results

Methods for and respondents' experiences of communication of carrier results varied considerably within and between regions, and within and between SC and CF contexts. Approaches ranged from letter or telephone call alone, to in-person communication in the clinic or at home, with health professionals from haemoglobinopathy, CF, screening and genetics backgrounds, or from community and primary care, such as health visitors with SC carrier results. Health professionals identified pros and cons of different methods, preferring opportunity for face-to-face communication with parents where possible, particularly for CF carrier results. They were concerned by regional variations in protocols, the lack of availability of translated information on SC carrier results, and the feasibility of sustaining more 'specialist' involvement at current levels, particularly for SC carriers. They were positive about involvement of primary care based generalists if appropriately supported, but felt this may be less feasible for rarer and potentially more complex CF results.

Parents were often poorly prepared for the possibility of a newborn carrier result. Some had felt overloaded by screening information received during pregnancy or prior to newborn screening, or found this information failed to meet their needs. They sought timely and specific information at each successive stage of the screening and communication pathway.

Opportunity for face-to-face communication of results was valued by parents of SC carriers and appeared particularly necessary for those without prior knowledge of SC carrier status or where English was not their first language. Indirect communication of results by letter appeared effective and feasible for parents more aware of SC carrier status from antenatal or earlier experience, and where this communication contained an unambiguous opening statement emphasising 'your child is not ill'. Face-to-face communication of CF carrier results by professionals with screening, CF or genetics backgrounds worked well for parents, but communication and information was crucially lacking at the earlier stage of repeat blood spot testing, which involved midwives or health visitors who could be uncertain of the CF screening process, creating considerable distress among half of respondents.

Rather than learning of their newborn's carrier status in itself, untoward anxiety or distress among parents appeared influenced firstly by *how* information and communication was offered to them during the screening process, and secondly if they had less prior awareness of carrier status or the possibility of a carrier result. Parents could fear their child had a serious problem, particularly while awaiting results or before seeing a professional, and be left in an information vacuum. Parental distress and anxiety appeared mostly transient, subsiding with understanding of carrier status and communication with a professional. Only a minority of parents appeared to have continued concerns about their child.

Respondents had no particular preference for the type of health professional who communicated results to them, as long as they were well informed and could answer their queries. Parents who had received written information about carrier results found this useful for reference and for discussion with their families. However, this information could be insufficiently detailed for some, and poorly accessible in content and language for others.

Parents regarded carrier results as valuable information gained fortuitously. They sought to share this with their extended families and to inform their children in the future. Respondents felt community awareness and information about SC and CF could be improved. Although there was some evidence of misconceptions about SC, most parents understood the benign implications of carrier status and that it may impact on future reproductive decisions. However, parents needed greater support after communication of results in considering and accessing cascade testing, and negotiating further communication within their families. Extended families' reception of carrier information ranged from being supportive to negative reactions or avoidance of the news.

Conclusions

Methods of communication of newborn carrier results vary considerably across England. Parents' needs for timely and appropriate information may not be met consistently or adequately. Respondents' experiences suggest a need for greater recognition of communication with individuals occurring across a screening pathway, rather than as a discrete event.

Implications for health care

Current practice could be enhanced by improving pre-screening information to include the prevalence of SC and CF carrier status, the common possibility of a newborn SC carrier result, and what to expect in relation to a repeat blood spot; recognition that the effectiveness and acceptability of communication of results indirectly by letter or in person may vary according to individuals' prior awareness or language needs; and provision of translated forms of SC carrier result information. In communication of CF screening, clear specification of information for provision to parents at the time of repeat blood spot testing is needed, with explicit guidance for communication by professionals undertaking this test; and in-person communication of carrier results by a well-informed professional.

Growth in carrier identification following expansion of newborn screening programmes may increase demand on those with condition-specific or genetics expertise. According to local contexts, such as prevalence of SC, the potential for greater involvement of primary care based professionals within mixed models of communicating carrier information could be explored; and a locality-based screening practitioner role operating across programmes to provide support for parents, and liaison with other professionals, during screening and following screening results, could be further developed.

Recommendations for research

Further research is needed to: (a) design and evaluate specific information for parents approached for a repeat blood spot in CF screening; (b) explore the value of refining current pre-screening information to better prepare parents for the possibility of carrier identification; (c) develop and evaluate the accessibility and acceptability of translated forms of standardised SC carrier result information; (d) prospectively study or audit practice with the further establishment of screening programmes; (e) investigate how health professionals use and present information across the screening pathway; (f) develop and evaluate support and training for health professionals involved in screening to be able to communicate relevant information; (g) examine the use of differing mixed service models according to local contexts; (h) investigate parents' attitudes towards, access to and experience of further carrier testing for themselves or their other children, and its impact on later reproductive decisions; (i) develop and evaluate methods to support cascade testing and communication of carrier information with children and families; (j) explore the uptake of information and counselling, community awareness and its influence on the screening experience; and (k) further experience of families over time to enable greater understanding of longer term benefits or harm of newborn carrier identification.

Chapter I

Introduction

This chapter describes current contexts for newborn screening and the rationale for this study. It includes a review of relevant experience and existing evidence on methods of communicating newborn carrier status information. Relevant evidence or discussion of issues relating to newborn screening for sickle cell (SC) disorders or cystic fibrosis (CF) is considered separately where appropriate or together where common to both conditions.

Newborn screening and carrier identification

Population-based newborn blood spot screening involves public health screening programmes to identify infants at risk of particular health conditions. These include genetic conditions with an autosomal recessive inheritance pattern, where there is benefit from early identification and treatment. Newborn screening for the recessively inherited phenylketonuria, for example, and congenital hypothyroidism have been long established in most developed countries, including the UK, providing clinical benefit to affected infants.¹ However, newborn screening programmes have recently expanded in some countries to increase the number of disorders screened. The inclusion of conditions where the balance of benefits and harms may be more highly contested has led to considerable debate at policy levels.²⁻⁴

Newborn screening for SC disorders and CF, which has been available in some parts of the UK for over two decades, has recently been universally implemented across England as part of the NHS newborn blood spot (heel prick) programme. The aim is identification of babies affected by these conditions, to enable early treatment and support to reduce morbidity and mortality, but screening also identifies infants who are healthy carriers. SC carriers may experience problems in unusual very low oxygen situations, such as general anaesthesia, or at high altitude, and a small proportion (estimated at approximately 6%) of CF carriers may be affected with the condition. Carrier detection by population newborn screening has been seen as problematic given there is no

immediate clinical benefit to the child,⁵ and concerns that conveying carrier results to parents may harm the parent–child relationship or affect the child’s well being.⁶⁻¹² Concerns have included the impact of receiving unanticipated results,^{7,9,13} difficulties in understanding that carrier status differs from being affected with the disease,¹⁴ fears about potential stigmatisation^{6,15} and the potential of revealing non-paternity. Some have highlighted that children have not consented to be identified as carriers,^{11,15} and that their confidentiality may be more difficult to ensure than for those tested during adulthood.^{12,16} However, knowledge of a child’s carrier status and its implications may be helpful as this can have reproductive implications for child, parents,^{6,8} and the wider family.¹⁷

Newborn screening for sickle cell disorders

Sickle cell disorders and beta thalassaemia major are recessively inherited disorders affecting the structure or quantity of haemoglobin respectively. They are potentially life threatening, causing anaemia and a range of disabling morbidities. SC disorders are most common among people of African origin. Thalassaemias are more common among individuals originating from the Mediterranean, Indian subcontinent, and the Middle and Far East. However, haemoglobin gene variants may occur in any ethnic group, and this is now more common with greater ethnic diversity in relationships. There are an estimated 637,000 carriers of haemoglobin gene variants in England (1.2% of the whole population, and up to 25% of people in some ethnic groups).

The most common haemoglobin gene variants are Hb S (sickle cell), Hb C, Hb beta thalassaemia, Hb E and Hb D Punjab. Global population movement and mixing mean haemoglobin disorders are increasingly common in countries of Northern Europe and the USA, where they were not previously endemic. Haemoglobin disorders and CF are now the most common recessively inherited disorders in the UK. People who carry a gene variant for one of these conditions are healthy, but can have an affected child if their partner is a carrier of the same condition.

In England, the NHS committed to implement a linked antenatal haemoglobinopathy and newborn SC disorders screening programme by 2004.¹⁸ This followed more than a decade of lobbying, reports and reviews.^{19–21} Implementation of universal newborn screening for SC disorders in England commenced in September 2003 and was completed in July 2006. Implementation is planned for Scotland by 2010, but no date has yet been set for implementation in Wales and Northern Ireland.

The UK National Screening Committee (NSC) recommended that the programme should not aim to identify gene combinations that are not clinically significant as there is no evidence that their detection leads to any benefit. In accordance with pre-existing practice in areas already undertaking newborn screening, the NSC supported the programme's recommendation that newborn carriers of the main haemoglobins including S, C, D and E should be reported to parents. While some clinical geneticists have suggested this information should be withheld,²² the policy decision to inform parents is consistent with recent evidence synthesis in the USA.²³

Newborn screening identifies carriers of structural haemoglobin variants, of which the most common is sickle cell. (For ease of reference 'SC' is used in this report to refer to all haemoglobin variants detected by newborn screening. This does not detect thalassaemia carriers.) There is no available method of testing without detecting SC carriers. Linked antenatal carrier screening of mothers for haemoglobin disorders in England, to identify the risk of having an affected child if both parents are carriers, means that parents may have raised awareness of being an SC carrier and its implications, and potentially may be more prepared for the possibility of their baby being identified as a carrier. Antenatal screening is universal in areas of England with a high prevalence of SC and by family origin in low prevalence areas. (As defined by the NHS Sickle Cell & Thalassaemia Screening Programme, high prevalence areas are those where sickle cell disease is estimated to affect more than 1.5 per 10,000 pregnancies and low prevalence those with less than 1.5 per 10,000 pregnancies being affected.)

Newborn screening in England has identified a national birth prevalence of just over 1 in 2000, or over 300 newborns per year (screen positive results indicating affected with SC disorder); and over 8500 newborn carriers per year (17,372 newborn carriers in England or 14.49 per 1000 babies in the 2 years to March 2007.²⁴ In practical terms, for

service providers and parents, this means an SC carrier result is by far the most frequent outcome of newborn screening requiring communication to parents (other than the commonest result of nothing identified by screening).

Newborn screening for cystic fibrosis

Cystic fibrosis is a recessively inherited, chronic and life limiting illness, affecting 1 in 2500 babies in the UK or 240 babies annually. It occurs in anyone but is more frequent in people of Northern European origin, and affects the lungs, digestive tract and pancreas by clogging them with thick, sticky mucus. Daily physiotherapy, dietary supplements and intensive treatment for chest infections are needed. The carrier rate of CF in the UK general population is 1 in 25. The case for newborn screening for CF is that identifying children when they are still asymptomatic will postpone lung damage in particular, thus improving prognosis and quality of life.²⁵ Population screening is needed as children with CF are often born into families with no history of the disease.^{26,27} Early identification of those with CF may extend their lifespan to over 50 years.^{28,29}

Screening protocols for CF differ across countries (*Box 1*)^{30–32} and have differed within the UK.³³ The NHS in England advocated the introduction of newborn screening for CF in 2001,³⁴ and in 2004 the NSC supported the extension of newborn screening for CF to the whole of England using a universal immunoreactive trypsinogen (IRT)/DNA/IRT protocol. In contrast to SC screening, the national protocol for CF screening in England aims to identify a maximum of children with CF while minimising carrier detection (estimated at around 200 annually) (K Southern, 2008, Leeds, personal communication).

The protocol in England involves measuring IRT levels to identify babies with levels exceeding the 99.5th centile, indicative of a risk of CF. IRT is present in much higher quantities in newborns with CF. It can, however, be raised for other reasons, including that the child is a carrier of the genetic alteration (mutation) responsible for CF.³⁵ Samples from newborns with raised IRT levels undergo DNA analysis to establish whether the child has CF. The possible outcomes of the DNA test are that a child has two mutations, and is therefore likely to have CF, or has one mutation and is probably a carrier. Children with suspected CF are immediately referred for a clinical diagnosis.

Box 1 Screening protocols for CF in different countries

For example, in the US, three different methods are used to screen for CF in newborns. In all programmes, the first stage of screening entails measurement of immunoreactive trypsinogen (IRT) on dried blood spots. An elevated IRT level indicates an increased risk of CF. In some states, a second stage involves a repeat IRT. If the repeat is elevated, the child is referred for a clinically definitive sweat test. In other states, the second stage involves a DNA test for CF mutations on the original blood spot. More than 1000 CF mutations have been discovered, and the genetic test may include as few as one mutation (delta F508) or several dozen. Because many mutations are not included, children are also referred for sweat tests if only one mutation is found or if the IRT is so high as to be suspicious. Some states carry out all three stages, including two IRT tests plus DNA analysis to minimise the number of children who need to undergo sweat testing. In Europe, most programmes incorporate DNA analysis, but at least one programme performs only one IRT and goes immediately to sweat test. Australia and New Zealand use an IRT/DNA approach with regional variability in the number of mutations included.

Those with one mutation, or an initial IRT level exceeding the 99.9th centile and no detected mutation, require a second blood spot test to verify if the IRT level is still elevated at 3–4 weeks when IRT levels are more discriminatory. In those children with one mutation where the IRT level remains elevated, the likelihood of CF is regarded as high and triggers clinical referral, while if not still elevated the child is regarded a healthy carrier. As not all CF mutations can be identified, a very small proportion of those identified as ‘carriers’ may develop CF because they have one identifiable and one unidentifiable mutation. In some other screening programmes, CF carrier status is only identified after a normal sweat test diagnostic for CF. In England, however, the further IRT step with a second blood spot specimen allows most children who have an initially elevated IRT but only one mutation identified to be regarded as carriers without referral for sweat testing, which can be stressful for families and has resource implications. In those children with an initially raised IRT level greater than the 99.9th centile and no detected mutation, the IRT on second blood spot test will remain elevated in a small minority, triggering clinical referral for a high likelihood of CF.

Sickle cell and cystic fibrosis newborn carrier identification: key differences

There are thus a number of significant differences between newborn screening for SC and CF. Firstly, the number and proportion of carriers identified by newborn screening for SC is very much higher than for CF (around 8500 SC compared with 200 CF carriers per year in England). Secondly, linked antenatal carrier screening of mothers for

haemoglobin disorders in England means that parents may have raised awareness of being a SC carrier and its implications, and potentially be more prepared for the possibility of their baby being identified as a carrier.

Thirdly, newborn screening for SC identifies carriers based on the initial heel prick blood spot sample alone, and thus the first communication parents receive following this may typically inform them of their child’s healthy carrier status. In contrast, a two-stage screening protocol for CF, following the initial heel prick test, results in parents being made aware that further testing using a second heel prick sample is necessary before being informed their child is a carrier 10–14 days later. As the initial raised screen may indicate CF, the first communication to these parents following the initial heel prick screening test may include that their child is at an elevated risk of having CF. As such, it has been suggested this communication be routinely carried out in person.

Finally, as not all mutations for CF can be tested for, apparent carriers of CF have a residual risk of being affected with CF which only becomes evident later in life; while parents of SC carriers can be reassured that their child will never be personally affected by the disease state.

Communication of carrier results following newborn screening

For the benefits of newborn screening to be realised with minimal harm, effective communication resulting in fully informed parents is the aim.^{36–40} The goal of carrier communication is to ensure that parents understand the benign health, but important reproductive implications for their

child, without provoking unnecessary anxiety or concern.⁴¹

National guidance for health professionals in England

National guidance recommends parents should be informed of carrier results as soon as possible. The UK Newborn Screening Programme Centre (UKNSPC) recommends that in relation to CF 'where possible, a screening nurse specialist contact the family's health visitor (or other designated health visitor appointed to give screening results) to discuss the screening result and that the health visitor or alternative professional (trained to give screening results) make a visit to the family to inform them that their baby is thought to be a carrier of CF, providing parents with designated written information on screening results.'⁴²

The NHS Sickle Cell & Thalassaemia Screening Programme advocates that parents 'receive relevant information and material about the result and, as a minimum, be offered access to an appropriately trained health professional to discuss the result.'⁴³ In addition, a health professional handbook⁴⁴ is available for health professionals involved in screening, which provides detailed guidance regarding the performance of newborn blood spot screening and related communication across all screened conditions. Electronically available concise information and guidance is also available on www.pegasus.nhs.uk (see Training support for health professionals involved in screening) with brief key points, and further core information on newborn blood spot screening for SC and CF.

Written information for parents

Various leaflets designed nationally have become available to support communication regarding newborn blood spot screening in England.^{45,46} Parents are first intended to receive information antenatally in a 72-page booklet about all antenatal and newborn screening tests.⁴⁶ A further 32-page booklet on newborn screening tests alone (repeating the same information as the earlier booklet) is expected to be provided to mothers during the third trimester of pregnancy and the postnatal period prior to newborn screening.⁴⁷

Further leaflets have been developed by the UKNSPC for parents receiving newborn carrier results for CF,⁴⁸ and by the NHS Sickle Cell & Thalassaemia Screening programme for parents

receiving newborn carrier results for SC⁴⁹ and unusual haemoglobin variants.⁵⁰ At the time of writing, these newborn carrier leaflets were only available in English.

Training support for health professionals involved in screening

Recognising a need for educational and training support for the different range of health professionals involved in antenatal and newborn screening for haemoglobinopathies, the NHS Sickle Cell & Thalassaemia Screening Programme funded the PEGASUS (Professional Education for Genetic Assessment and Screening) Programme in 2004. This developed a range of electronically available resources for health professionals and those with public health functions (www.pegasus.nhs.uk); a course for specialist counselling practitioners; and materials and support for the cascade of face-to-face training at service level, in particular for midwives, facilitated by local health professionals trained to cascade training to others using the materials. This was implemented, with the support of NSC regional screening teams, across the majority of maternity Trusts and some primary care settings in England, mostly in 2006 and 2007.⁵¹

Similarly, in 2005, the UKNSPC developed training for health professionals to offer parents informed choice regarding newborn screening for CF.⁵² Local implementation groups were tasked with addressing personal and local training needs, and a training the trainer approach with workshops delivered at national and local level was suggested. Training materials included presentations, one concerned with communicating with parents about newborn blood spot screening was made available on the UKNSPC and the NSC Continuing Professional Development websites.⁵³

Sustaining such training at service level proved challenging, and included the problems of implementation of several parallel training initiatives, including those above, for different antenatal and newborn screening programmes within service and resource constraints. There remains a need to address this for those currently involved in screening programmes, and to address the relative paucity of training aimed at improving the genetic literacy of practising health professionals at both pre- and post-registration levels.⁵⁴

Communication of carrier results following newborn screening: current evidence

This section summarises existing evidence relating to communication of SC or CF carrier results following newborn screening. It draws on relevant secondary research (reviews, systematic reviews, health technology assessment) and a review of primary empirical research relevant to communication of newborn carrier results. Relevant literature was sought by search of OVID databases including MEDLINE, EMBASE, PsycINFO, CINAHL and SSCI. Search strategies included index terms: newborn screening, neonatal screening, blood spot, heel prick, carrier, sickle cell, haemoglobinopathy, cystic fibrosis, heterozygote and trait.

A synopsis of primary studies, of any design, identified as including relevant data is provided in the table in Appendix 1. This briefly describes study settings; focus on SC, CF or both conditions; design and method; participants and sample; and key findings. The large majority of these studies concern North American experience of newborn screening.

Summary of current evidence

Internationally, there is no clearly established evidence-based approach to effective communication of newborn carrier status. In their systematic review published in 2004, confined to experimental evidence, Oliver *et al.*⁸ found no controlled trials of interventions to disclose newborn carrier status to parents, and this remains the case. Reviews^{1,8,20,55–57} have focused on the cost and effectiveness of antenatal and newborn screening for SC and thalassaemia^{20,21} or newborn screening for CF¹ and its benefits and risks⁷ rather than on methods and effects of communicating carrier results. Other reviews note evidence on parents' experiences of newborn screening has been limited,⁵⁵ in particular concerning their experiences of receiving carrier results, with what is available being less explored for SC carrier communication.⁵⁷

Research with parents following newborn screening supports disclosure of newborn carrier status.^{13,15,57–60} However, there is commonly inconsistency in whether specific communication protocols are in place for SC or CF carrier results,^{37,61–63} and further research is required

into parents' experiences or understanding of such communication¹³ and the most effective and acceptable communication models.⁸ There remains little guidance on the most appropriate ways to convey carrier status results,^{8,41} or research on parents' experiences of receiving carrier results to inform approaches.^{13,57,64} Relevant work is generally limited to local descriptive reports on experience of newborn screening for SC^{65–69} or CF.^{58,59,70–72}

Anxiety and understanding following carrier results

While research in relation to newborn CF screening may suggest little evidence of enduring adverse psychosocial effects,^{7,59,73} parents may be distressed or depressed during the process of newborn screening,^{14,60,74–80} which may relate to difficulties in understanding relatively complex information.^{15,58} Health professional communication may also shape parents responses to newborn CF screening results,⁸¹ which can include shock and anxiety,^{14,58,59,82,83} with health professional communication following newborn carrier identification sometimes found wanting by parents in relation to both CF and SC.^{58,84,85} One study found a significant proportion of parents of CF carriers had not understood, 1 year after newborn carrier identification, that their child was at increased risk of having an affected child.¹⁵ While another found residual anxiety among some parents about their child's health and reproductive decisions 6 years after being informed of newborn CF carrier status.⁶³ This suggests that some parents' information and support needs may not be met. There has been less empirical work conducted with parents of SC carriers following newborn screening but counselling has been advocated,⁸⁶ without which it has been suggested results may cause undue anxiety and parents may fail to appreciate the implications of the results.⁸⁷

Methods of communicating carrier results

One study in the USA found that offering parents genetic counselling on the day of their child's CF sweat test lead to a significant increase in acceptance rates compared with parents required to return at a later date.⁸⁸ A pilot randomised trial, also in the USA, suggested that in-person genetic counselling after parents had been informed their child was a carrier lead to an increase in parental testing for CF carrier status,⁸⁹ although it was unclear whether parental testing was recommended to parents in the control group.

Other work in the field has been descriptive. For example, Kladny *et al.*⁴¹ compared service use following intensive follow-up (telephone contact, letters and audiovisual information) or traditional imparting of SC carrier results via letters as part of local service development in the USA, finding that the former lead to increased uptake of genetic counselling by telephone and interest in family testing. This is consistent with previous positive experience of using video information followed by genetic counselling⁹⁰ and other research suggesting the benefits of providing audiovisual information prenatally on subsequent information retention for parents of newborn SC carriers.⁶⁹

Parents' experiences of newborn screening

Existing research that has used quantitative methods to examine parents' experiences has tended to measure service use,^{74,89–91} or has used methods that have limited parents' ability to convey their experience or understanding of results,^{41,63,67,74,92} while research relating to SC is particularly limited⁶⁷ (see Appendix 1).

To date, 11 qualitative studies have examined the views of parents with experience of newborn screening,^{59,60,79,81,93–99} although samples have sometimes combined parents of affected children, carrier children, or unaffected children.^{59,81} This work suggests that while parents are supportive of newborn screening they may have concerns about the communication of results,⁵⁹ they may want information to be presented orally with an accompanying leaflet antenatally,⁹³ and their ability to recall information is reduced when it is provided to them during the emotionally demanding newborn period.⁹⁵

In one qualitative study in the UK, which included parents of five SC carriers and five CF carriers, parents emphasised issues of retaining genetic knowledge, their own carrier status in relation to reproductive planning, and sharing information with their wider family.⁹⁹ In a more recent study, the typical experience of parents of nine newborn SC carriers in England of receiving results by letter was found to be unhelpful, especially if parents had little awareness their baby had been screened, and it was suggested that personal communication by telephone or in person may be preferable.⁹⁸ In other work, in one region of England, with 21 parents who received 'false positive' IRT results, waiting for confirmatory results was distressing and parents suggested the need for better information

about screening, guidelines for health visitors communicating initial raised IRT results, and reduced waiting times for repeat test results.⁷⁹

Another US study with 28 family members of 14 children who underwent sweat tests for CF (13 false positive) identified three factors contextualising parental responses: prior knowledge of CF, newborn screening and carrier status; parental adaptation to newborn; and health professionals' communication with family.⁶⁰ Parents who had some awareness of CF, but incomplete knowledge, had more negative reactions than parents who were very knowledgeable or had no prior knowledge. Additional contributors to negative reactions were if the need for further testing had been conveyed via the telephone or an answerphone message, had not been wholly explained, or had been communicated before the child was old enough to have such tests. Subsequent work in the USA with families of 25 CF carriers has highlighted families' needs for factual information and emotional support.⁹⁶

Health professional perspectives

Research on the perspectives of health professionals^{40,61,62,81,93,100–106} has tended to include those less involved in direct patient communication,⁶¹ or has focused on communication protocols,^{61,101} knowledge,^{62,93,103} and views on screening^{102,104} and information needs⁸¹ rather than health professionals' experiences of communicating results to parents. This work has highlighted a lack of universal communication protocols^{61,101} and raised concerns about the provision of adequate⁶² and timely services,⁶¹ particularly if the recipient of carrier information does not have English as their first language.⁶¹ Recent work with US general paediatricians and family physicians found the majority perceived a need for parents who receive newborn carrier results to be referred for genetic counselling, particularly for CF and if the responding health professional was a family physician.¹⁰⁷

Health professional communication of screening results

Farrell *et al.*¹⁰⁶ in the USA have examined paediatric residents' communication of SC and CF carrier results in simulated scenarios with analysis of 59 communication transcripts.^{40,100,106} This work suggests the absence of key information, the use

of potentially distressing information initially, and the predominance of jargon in communication may compromise effective communication of carrier results. Farrell *et al.*¹⁰⁶ suggest 'communication quality may be characterised by moments of excellence surrounded by missed opportunities and an unfortunate emphasis on [the prognosis of the disease]'. Clearer communication policies¹⁰⁸ and a checklist with better information resources for health professionals to utilise when conveying carrier results are increasingly supported.⁹³

Rationale for current study

In summary, newborn screening for SC and CF is widely supported, as is the communication of 'incidental' carrier results. The benefits of identifying carriers may relate to informed choice when clear communication and an understanding of the benign nature of the results are of central

importance. However, there is currently limited evidence to inform how best to communicate newborn carrier results to parents^{8,32,109} and a paucity of evidence on current practice and methods for doing so,^{13,57} in particular from parents' experiences.^{13,57,90}

The current study was commissioned by the Health Technology Assessment (HTA) programme in November 2005, and took place between June 2006 and November 2008. During this period there was ongoing implementation of universal newborn screening for SC and CF in England, with this fully operational in all regions by the end of 2006 and 2007 respectively. The study aimed to explore current practice, methods and experience of communicating carrier status information following newborn screening, with a particular focus on parents' experience, to inform best practice and potential further research.

Chapter 2

Aims, objectives and overview

Aims

The central question posed by the HTA programme in its original commissioning brief focused on establishing the most effective method for communication of carrier results following universal newborn screening, and a trial comparing different methods was envisaged. This brief was revised by the HTA when it became clear, in discussion with NHS stakeholders and the study team, that there was insufficient knowledge about current practice and methods, and universal newborn screening for CF and SC was still being implemented across the whole of England. Thus the overall aim of this study was:

- To describe and explore current practice, methods and experience of communicating carrier status information following newborn screening for CF and SC disorders to inform practice and further research.

Objectives

The study sought to address the following questions:

1. What is current practice for communicating carrier status information following newborn screening for SC disorders and CF in England?
2. What are the views of health professionals involved in communicating carrier status information on the acceptability of, feasibility of, effectiveness of and preference for methods of informing parents?
3. What are parents' experiences and views of how they are informed and the support they are offered?
4. How well is carrier status information understood by parents?
5. What is the impact on a family of being informed of newborn carrier status, and is this information shared within the family?
6. What can we learn from existing evidence and current practice and experience about the effectiveness and feasibility of methods for communicating carrier status information, and what further research is required?

Methods

We undertook three linked qualitative studies across England with:

- child health screening co-ordinators in all health regions
- health professionals communicating results to parents
- parents of newborn carriers, this formed the principal part of the study.

The first study was a preliminary phase with child health screening co-ordinators in all English health regions. This sought to identify proposed or existing models for imparting carrier status information in practice, and explored associated challenges for policy at a relatively early stage in the implementation of SC and CF screening programmes. This took place in the second half of 2006 when some regions had implemented, and some had not yet operationalised, universal newborn screening for SC and/or CF. A further objective of this phase was to inform recruitment and sampling for substantive study with parents.

The second and central part of the study involved in-depth interviews and exploration, during 2007 and 2008, with a national purposeful sample of parents of infants identified by universal newborn screening as carriers of SC or CF. This included a phase of later respondent validation. In parallel with interviewing parents, in a third study, telephone interviews and focus groups were conducted with a key informant sample of health professionals with contemporaneous personal experience of conveying newborn carrier results to parents.

All study phases were approved by a UK Multicentre Research Ethics Committee (West Midlands). Study completion involved negotiating two particular challenges. Firstly, the widely varying local NHS research and development (R&D) requirements and approval processes in over 30 R&D units serving Trusts that were selected before respondents could be approached with study information and invitation (average time from application to Trust approval of 11 weeks,

range 1–42 weeks). Secondly, as implementation of universal newborn screening for SC and CF was ongoing during the study period in England, and given that very small numbers of CF carriers were detected, an extension of the study period was required to enable recruitment of parents of newly identified carriers with experience of the range of differing methods of communication in some regions.

The methods and results of each part of the study are presented in separate chapters in this report. Given significant differences between newborn screening for CF and SC, relevant results for each are presented separately where appropriate, and alongside those findings which were common to both programmes. Discussion of all study results with their interpretation and implications are presented in Chapter 6.

Chapter 3

Current or proposed models of communicating newborn carrier information: regional screening co-ordinator perspectives

Background

Prior to implementation of national programmes in England, newborn screening for SC and CF has been offered on an ad hoc basis, with CF screening available to 20% of babies (areas served by laboratories in East Anglia, East Midlands, South Yorkshire and Leeds) for over 15 years, and over 10 years for SC in some areas in London, the east of England and Birmingham. Over this period, practice for informing parents of their infants' carrier status has varied according to condition and locality.¹¹⁰ Given a lack of data on models being used, the extent of variation, and experience of implementation following the advent of universal screening, this preliminary phase of work¹¹¹ firstly sought to identify existing or proposed models for giving out newborn carrier results across England, and, secondly, was used to inform later purposeful sampling of parents experiencing communication of results by different methods (see Chapter 5).

Methods

Semi-structured telephone interviews were conducted with the Regional Child Health Co-ordinator from each of the nine English health regions during the second half of 2006. Consent to be interviewed was initially obtained by email and again verbally on tape at the start of the interview. Participants were invited to reflect on the extent of regional implementation of CF and SC newborn screening, actual or proposed models for giving results, the need for condition specific models, who should give the results, and suggestions for improving current practice and policy. Respondents were also able to raise other issues of importance relevant to the subject. Where informants were unable to provide sufficient details, brief telephone calls or emails to specialist services were used to acquire supplementary information. Interviews were tape recorded and transcribed verbatim. Data were thematically coded and analysed according to emergent themes by an experienced social sciences

researcher who had conducted the interviews, and another researcher with a health psychology background. Subsequent feedback invited from all participants on a preliminary draft of the findings was also used to confirm and slightly refine them.

Results

In summary, respondents highlighted that diverse methods for imparting carrier results were being implemented or planned within and between regions, and within and between the two conditions. Models ranged from imparting results by letter alone to in-person communication during a home visit or specialist clinic attendance, with delivery by specialists (such as a haemoglobinopathy counsellor, specialist CF nurse, genetic counsellor) or generalists without specialist genetic expertise such as health visitors. The latter were potentially considered best placed to give results, and a similar approach for both conditions was emphasised. While national guidance was influencing choice of models, other factors contributed such as existing local service structures and lack of funding.

Challenges identified for implementation included uncertainty about guidance specifying in-person notification; how to balance allaying potential parental anxiety by using familiar 'non-specialist' health professionals with concerns about practitioner competence; and the extent of information parents should be given. In addition, co-ordinators identified inadequate consideration of resource and service workload as policy obstacles. Integration of the two screening programmes, and 'normalising' carrier status were also suggested as likely to help.

Description of regional models

Participants reported a variety of models, proposed or already in operation, for imparting carrier results (see *Table 1* for a summary of practice across

TABLE 1 Methods used or proposed for imparting newborn carrier results in English regions (2006)

Region	SC carriers	Newborn SC screening started in	CF carriers	Newborn CF screening started in
North West	In person by purpose-trained health visitor	2005	In person by purpose-trained health visitor	Not yet started at time of interview
West Midlands	In person by haemoglobinopathy counsellor OR Letter with result plus appointment for counselling	2004	In person by specialist counsellor plus family health visitor	Not yet started at time of interview
South West	In person by family health visitor or haemoglobinopathy counsellor OR Letter with result plus option to attend haemoglobinopathy service	2004–6	In person by genetic counsellor or antenatal screening co-ordinator	Not yet started at time of interview
London	In person by family health visitor or haemoglobinopathy counsellor OR Letter with result plus appointment for counselling, or option to attend specialist service or 'drop-in' clinic	1995–2005	Undecided at the time of data collection	Not yet started at time of interview
North East	In person by Haemoglobinopathy counsellor plus family health visitor	2005	In person by purpose-trained health visitor plus family health visitor	Not yet started at time of interview
East of England	In person by haemoglobinopathy counsellor or purpose-trained health visitor OR Letter with result plus appointment for counselling	1997–2005	In person by specialist CF nurse	1980s in Cambridgeshire
South Eastern	Haemoglobinopathy counsellors contact and inform parents (details on exact methods not collected)	2003–6	In person by purpose-trained midwife	2006 in Thames Valley
East Midlands	In person by general practitioner plus referral to clinical genetics or follow-up by haemoglobinopathy counsellor	2004	In person by screening specialist nurse	1989
Yorkshire and Humber	In person by purpose trained health visitor or haemoglobinopathy counsellor OR Letter with result plus appointment for counselling	2004	In person by family health visitor plus specialist CF nurse or by family health visitor alone	1997–2007 1989 (South Yorkshire)

England), with diversity of models both within and between regions and both within and between conditions. All regions did or expected to inform parents of CF carriers in person using a range of methods, from notification by letter alone to

personal contact, for SC carriers. Health visitors had or were expected to have a prominent role, including a family's usual health visitor and those specially trained to communicate carrier results.

Factors shaping choice of method

National guidance

National guidance (as issued by the UKNSPC) for implementation most commonly influenced choices of methods for communicating carrier results. Guidance was perceived as more specific for the CF than for the SC programme. However, experience of implementing SC screening first had informed thinking about CF.

... because there were lines being drawn in the sand as to who should actually do this information, who should actually give this information and obviously we knew that cystic fibrosis was coming ... so I adopted the model for the sickle screening programme as well.
[regional child health screening coordinator (CHC 04)]

Resource constraints

Inadequate funding was affecting implementation of both the delivery of screening and, in particular, the choice of methods for communicating carrier results. This had necessitated efforts to secure funding from local sources, often short term and dependent on an individual manager's resourcefulness or sway within the local health system. Where no additional funds could be realised, existing staff had taken on communication of results in addition to their usual workload. Inevitably, these constraints had, in some regions, led to compromise and 'quick fix' models for communicating carrier results.

... I don't think there was due consideration given to the workload associated with giving carrier results and I think that was an oversight. There doesn't seem to have been any thoughts on how it would be ... It needs to be properly accounted for, like we introduce services and they give four quid a baby for the lab but it affects every different component part of the service. It affects the midwives and their counselling, it affects the health visitors giving the results and it affects the child health record departments who have to adapt their systems of working to record the results.
(CHC 02)

... it's [informing carriers] all done on goodwill, the PCTs [Primary Care Trusts] are asking where's the funding for this? And obviously it does take up some time, some practitioners' time.
(CHC 04)

Low or high prevalence areas for haemoglobin disorders

Specialist services have been operational in high prevalence areas long before the introduction of universal newborn screening. Bringing distinct advantages, such as expertise and referral protocols, a consequence is that regional plans for models of carrier results have to incorporate existing practice and organisational structures, resulting in less scope for innovation in some areas. Requesting changes to existing practice was a challenge, leading some interviewees to prefer starting service planning from scratch.

... it was easier to do the area that was a blank sheet because then you could do how best fitted what the geography and, you know, where the funds and all those sorts of things available were and you've also got some handle on what they do and can say what they should or shouldn't do. Whereas when there's already something in place it's harder isn't it?
(CHC 08)

In contrast, there were concerns about reporting results in low prevalence areas because of lack of resources and practitioner knowledge. Thus, although low prevalence settings provided opportunities for trying out new models of result giving, in some areas, urgency of need necessitated rapid implementation before localities were sufficiently prepared to deliver results.

Our real problem has been our low prevalence areas ... it was little bit hit and miss to be quite honest. We had a case ... where we found 60 children hadn't been given results. And that was a bit ... because people didn't know quite what to do with it, how to do it ...
(CHC 05)

Local consultation and preferences

Regional implementation groups were a common mechanism for discussion and planning of proposed models. For some, the challenge was to find a fit between national guidance and local resources and preferences. Regions who consulted widely about this specific issue and ensured extensive health professional (e.g. Directors of Public Health, Primary Care Trust screening leads, paediatricians, heads of midwifery and health visiting, etc.) engagement found that the process benefited implementation of the screening programme as a whole.

I think without doubt the implementation has brought more people around the table ... and trying to ensure that there is linkage and involvement across the whole of the screening profession. So making sure that every professional group, primary, tertiary and secondary level specialists have been involved in that decision-making has been beneficial.

(CHC 07)

A role for non-specialists

With some exceptions, most interviewees expressed a strong preference that conveying carrier results should be a task undertaken by non-specialist health professionals. During interviews, respondents used the term 'specialists' when referring to genetic counsellors, haemoglobinopathy counsellors and CF nurses. They regarded all other health professionals involved in communicating carrier status information as 'non-specialists'. Key to this position was the view that carriers were healthy. It was felt that using a specialist practitioner in this role could cause parents to believe that their baby was ill and increase their anxiety. Specialist time was felt to be more appropriate for providing further information to families who wanted to know more or wanted to discuss future reproductive decisions. While support for non-specialists giving results was consistent, informants were uncertain about how best to balance allaying parental anxiety by using a non-specialist and concerns about practitioner competence.

And we would like for them [specialist haemoglobinopathy counsellors] to spend more time doing the specialist stuff that a health visitor couldn't possibly do ... for the sickle cell-carriers it's quite a large workload and yet it doesn't need super-specialist people, it needs somebody with some extra training and some expertise and it's sort of half-way house.

(CHC 06)

Respondents working in regions where specialists were currently involved in giving results did not see this as a problem, although they were not insistent that specialists should be involved. In one region, concern had arisen about non-specialists giving CF carrier results because of the small risk that some carriers may be affected.

The importance of involving the family's usual health visitor in giving results was highlighted as

the best way to minimise parental anxiety, either as the sole professional giving the results, or visiting the family together with a specialist or purpose-trained non-specialist. Ensuring appropriate training for health visitors was an important consideration. Whether to train all of them to give results, knowing that some may never come across a carrier case, or to concentrate training on a selected group who would take on this role and accompany the family health visitor remained an ongoing debate for some regions.

... it seems to me that the best person to give the results so that it isn't worrying is in the middle of a routine health visitor visit without the phone call to say, 'hey can I see you', especially because in a sense that's making anxieties. But how do we maintain competence if even at local level you know no health visitor is going to be doing it every week say or even once a month so I think there's actually a real dilemma ...

(CHC 06)

Condition specific or same approach for both conditions

None of the interviewees were in favour of separate models for the two conditions. Two respondents, who had not yet implemented CF newborn screening, wanted to await further experience while others expressed strong preference for similar models and for close working between the two screening programmes. Another suggested that the difference between carrier results for the two conditions was overstated.

... I think there should be [the same model] ... I've thought about this quite a lot because with cystic fibrosis the results can be difficult to interpret and some of the mutations the significance of those isn't known. But then I thought with sickle cell screening some of the haemoglobin variants, the significance of those is unclear so the results of that can be equally as difficult to interpret and not always straightforward.

(CHC 01)

A common view was that there were more similarities, such as carrier status, recessive inheritance, and skills required to inform parents, than differences between the conditions. Therefore, it appeared logical to have the same protocol and organisational structure, albeit with some variation, for giving results.

Well when we were putting the whole system [SCD newborn screening] into place in the back of our mind all the time was the fact that CF has got to roll out and it makes sense to use the same mechanism because the counselling skill is the same isn't it? You know, telling somebody that there's a problem with their baby and this is the genetics and you know, that sort of skill ... a counselling skill is a counselling skill really isn't it?

(CHC 08)

I would think it should be the same method, you know, I think it should be. Ideally I mean it's the same recessive condition that you're describing, the same genetics involved so you know I'd be of the opinion you could do both.

(CHC 03)

Parity in methods for the two conditions was also seen as a way of addressing concerns about longstanding inequity in NHS service provision for SC disorders compared with CF.

I think it [methods for giving carrier results] should be standard but ... because I do find it ... I do find it personally irritating that there's this difference between sickle cell and CF. And professionally I think, well sickle cell is a genetic condition so why don't clinical genetics see it as their remit a little bit more because it is an inherited condition ... but that's always been the way. Sickle cell services seem to have existed running parallel to clinical genetics and erm ... so as I say, it's [sickle cell disorders] probably a bit of Cinderella area ...

(CHC 01)

Suggestions for advancing practice and policy

The need to clarify what was meant in national guidance by 'communicating in person' was a priority. Personal informing was seen as a costly process and some respondents suggested that an appropriate leaflet with contact details for further information could be as effective as a personal visit. Others considered using only written information unsatisfactory as varying reading levels would increase misunderstanding and service providers would not know that parents had received the information.

... I think we need a better definition of what is 'communicated in person' because you could interpret that, couldn't you, as here's the leaflet read it, it could be here's the leaflet shall we go

through it together ... erm ... through the whole thing about you know a specialist ringing up and saying nothing to worry about but I need to see you ... erm ... The other thing is in the 'in person', I mean if you've got a family that don't speak English ... if the health visitor doesn't speak their language but goes in with a leaflet in the right language you know, is that a face-to-face contact or whatever?

(CHC 06)

A nationally agreed protocol for informing carriers with clear expectations of what information needs to be communicated to parents and practitioner roles, more detailed than current guidance and similar for both conditions was suggested.

Well, it's about clear expectations. About making sure that there is clear linkage of what you do next. I think if you are going into a family to give a result, it is not just good enough to give a result and to give a leaflet. You must provide the next level of intervention. And that next level in intervention is about listening, and then signposting and very clearly where you go next. And it isn't just about saying 'go to your GP and they might refer you to clinical genetics' because some GPs may not. So I think that needs to be really erm ... agreed before we sort this out. What is the kind of things if people want further support? The other thing that needs to be clear, so that the health visitors are very clear, is about we are not asking them to become genetics experts and we are not asking them to become sickle cell experts ... we need to have some very clear role boundaries of what is expected and that is agreed boundaries and part of it is you may have a health visitor that is really interested and wants to do a lot more but is it appropriate?

(CHC 05)

Explicit national policy regarding cascade screening (testing of other family members), and whether and how to report results detecting non-significant haemoglobin variants would also be helpful. More practical proposals included scripts on what parents should be told, especially when handling contentious scenarios such as non-paternity; simplification of current leaflets for parents of carriers; and review of the timing of when parents are told what the blood spot test is for. As part of the call for continuity across both conditions, integration of the two programmes was

suggested as imperative to ensure consistency in practice (and arguably, equity).

The other stuff that we really, really need to do is to not do something totally different for CF and for sickle because we do an awful lot of going down different pathways and I don't think that makes any sense ... the integration of the two programmes is just so important because it's really hopeless if they don't erm ... because you get these mixed messages and you know you get it all being very special and very different. I mean it's one of the issues I think all children with chronic disease or carriers, they've got more in common through being children than they have in having a disease erm ... and it seems to me we shouldn't be taking people into different pathways simply because they've got one type of disease.

(CHC 06)

Respondents felt that giving results should be 'normalised' and incorporated into usual health-care practice. Where possible, lessons could be learnt from other screening programmes where results may be equally worrying. Increased public awareness of the conditions and screening programmes was also mentioned as a way of allaying parental concerns about carrier status.

I think the biggest problem for the counsellors is getting across to the parents that carrier status isn't a disease and I think if we could raise the public's understanding of what sickle cell was, I think that would help them enormously because [otherwise] they've got to start from zero haven't they really. And bring parents up because it can come out of the blue

can't it, they don't even know anything about it and then you're telling them that there's something wrong with their perfect baby.

(CHC 08)

Although confident that this task was within a non-specialist remit, participants noted concerns about practitioner competence. In particular, general practitioners' (family physicians') limited knowledge about the implications of carrier status was perceived as concerning and needed to be addressed.

Creation of a new post for a designated health professional within a specific locality, described as a 'newborn bloodspot practitioner', to take responsibility for newborn screening carrier results for all conditions was proposed. This was seen as a potentially practical way forward to facilitate continuity in liaison with laboratories and other stakeholders, and maintenance of professional competence in result giving. Respondents emphasised a need for research evidence to inform current practice. They wanted to understand more about the relative effectiveness and cost of various models and parents' preferences for delivery format and information content.

Regional screening co-ordinators' perspectives and experience were captured at a relatively early stage in relation to universal implementation of newborn screening for SC and CF, in the latter half of 2006. However, many of the issues they raised about the acceptability, feasibility and effectiveness of methods of communicating results to parents remain highly relevant to further experience of the screening programmes two years later, and these are discussed in Chapter 6.

Chapter 4

Views and experiences of health professionals communicating results

Objective

This phase of the work with key informants sought to establish views of health professionals with contemporaneous experience of communicating newborn carrier status information about the acceptability, feasibility and effectiveness of, and preferences for methods of informing parents.

Methods

Health professionals involved in communicating information about newborn SC or CF carrier status to parents were purposively sampled to include professionals using different methods of informing parents, and of varying disciplinary background and expertise such as condition or screening specialist and generalist community-based or primary care professionals, and practice in a range of contexts (e.g. differing patient populations and potential needs).

One-to-one and focus group interviews explored informants' experiences and views on the acceptability, feasibility and effectiveness of the different methods of informing parents that were used, and their preferences including perceptions of attendant service organisational issues and professional training needs. Professionals' views of communication processes and information materials used, suggestions for improvement to current practice, and strategies adopted for different cultural and language groups were explored. All interviews were audio-taped, transcribed, and data analysed by two study researchers (health psychology and social science backgrounds) independently identifying and sorting key emergent findings under common themes, which were further reviewed and agreed in discussion with a senior clinical academic researcher in the study team. Organisation and coding of data were assisted by use of NVIVO software. Themes were tested during subsequent data generation until no new themes were emerging, suggesting saturation. To enable respondent validation, a written synopsis of key

themes from analysis was sent to all participants, inviting comments and feedback.

Results

Ultimately 16 health professionals, selected as key informants reflecting a range of known methods of communicating carrier results in England, took part in two focus groups (one for CF involving six participants and one for SC involving six participants) and seven one-to-one telephone interviews between October 2007 and October 2008 (*Table 2*).

Approaches to communication with parents

These informants echoed some of the earlier perspectives of regional screening co-ordinators, reporting several models of communication in practice, most commonly including use of a letter giving the option of attending a clinic (e.g. with a haemoglobinopathy counsellor) in relation to SC carrier results; in relation to CF results, a telephone call and/or home visit by different health professionals (e.g. health visitor, or health visitor and CF nurse/specialist practitioner together); or the offer of hospital clinic appointment (e.g. to see a paediatrician).

Although discussing communication following newborn screening, respondents also highlighted the potential for developing policy 'upstream' from current approaches by considering carrier status preconception:

I would totally agree with (those) who say we are doing it the wrong way [... policy-makers] haven't got another policy where they see all new entrants or pre-marital or early adulthood screening, if they are not doing that [...] I think it is a missed opportunity.

(SC focus group participant)

Most regarded their current practice for communication with parents as effective for

TABLE 2 Health professionals involved in communication: key informants

	Regions reporting using method	Key informants interviewed
Health professional imparting CF carrier results		
Specialist CF nurse	2	2
Midwife	1	1
Specialist counsellor + health visitor	1	1
Specialist screening nurse	1	2
Genetic counsellor	1	1
Screening link health visitor (also SC results)	2	1
Health professional imparting SC carrier results		
Haemoglobinopathy counsellor ^a	8	5
Specialist counsellor + general practitioner	1	2
Health visitor	4	1
Screening link health visitor (also CF results)	2	1

a Includes two using only letters to communicate results.

their local contexts such as availability of local haemoglobinopathy services or prevalence of sickle cell. They described the pros and cons of their use of telephone, written and in-person communication of newborn carrier information, alone or, most often, in combination (summarised in *Table 3*).

Health professionals comfortable with using a telephone call to inform parents about carrier status results felt they could more immediately address parents' concerns, but nevertheless typically followed this with an offer of face-to-face communication. The use of telephone alone was felt to be problematic in ensuring the quality of the communication, assessing parents' level of

TABLE 3 Key informant experiences and perceptions of communication models

Benefits of method of informing	Issues with method of informing
Telephone	
More practical and time-efficient than visiting all parents, particularly of SC carriers	Parents' environment at the time may be problematic or compromise understanding
Can provide immediate reassurance	Less able to assess parents' understanding (non-verbal feedback)
	Unable to supplement explanation by drawing diagrams
Letters	
Feasible for providing large numbers of SC carrier results	Incorrect contact details
	Difficulty providing a balanced message that is taken seriously but does not trigger undue anxiety
	Unable to check parents' understanding
In person	
Most supported method, particularly for CF or where English is not the first language; underlines that the information was important	Challenging to deliver to large numbers of parents
Provides opportunity to check parents' understanding	Visit may unnecessarily raise parent anxiety

understanding non-verbally, and in particular where parents' first language was not English. For example:

... parents seem okay about the SC, you know the carrier status of it, because I can usually allay their fears on the phone really ... I think I'm happy with it doing it this way because ... parents have said ... no that's fine. I think as long as I phone up and say right I'll arrange a visit to come and see you this week
(Health visitor, conveying SC results by telephone call with a follow-up home visit in low prevalence area for haemoglobinopathies)

I guess it has been hard on the telephone too not being able to see their facial expressions, not to be able to show them simple diagrams. I guess those are the main issues ...
(Genetic counsellor, conveying CF results by telephone call with an offer of in-person counselling)

Particularly over the phone there had been an issue ... half of the people I give results to have English as a second language so explaining concepts to them which are sometimes hard to understand anyway and then with the second language it is a bit of a challenge ...
(Genetic counsellor, conveying CF results by telephone call with an offer of in-person counselling)

Professionals conveying SC carrier results, particularly in high prevalence areas, usually did so by letter initially, highlighting the practical challenge of sometimes having large numbers of parents to notify, and that some parents would already have received carrier information through antenatal screening. With experience of the latter, some professionals had found that parents did not always require a further offer of in-person consultation.

I wouldn't have time to go and see these 400 children [a year] at home, to go and tell them.
(Haemoglobinopathy counsellor, conveying SC results by letter with invitation for further counselling, in a high prevalence area)

What I found was they weren't coming so when I called them they said we were counselled antenatally and we have all the information we need ... So ... I devised another letter saying

that as you were counselled and the baby was found to be carrying whatever variant but as you were both counselled antenatally you may not find the need for a further appointment but should you require one please contact me.
(Haemoglobinopathy counsellor, responsible for all antenatal and newborn counselling in her high prevalence area)

Professionals communicating CF carrier results usually did so in person at some point in their interaction with parents because these results were perceived as more complex, and they had also found earlier communication with parents at the time of the second heel prick test had been variable in quality and quantity. For example:

After that second blood test parents I think in general have been hugely anxious. I think that is the worst time for them that week or so or however long they are waiting for that result. ... I think it is very variable it depends entirely or largely on what the midwife tells them. So I never know when I ring them what they have been told.

(Genetic counsellor, conveying CF carrier result by telephone with offer of in-person counselling)

I mean I would feel very uncomfortable not meeting face-to-face with the family and not seeing the child and I wouldn't feel happy about having a telephone contact as that being adequate. I think parents deserve face to face.
(CF focus group participant)

Use of supporting resources

Communication of results was supported by use of written information that was locally produced and/or that provided by the relevant national screening programme. For SC carriers, most informants used written information from the Accessible Publishing of Genetic Information (ApoGI)¹¹² or information they had devised locally, including locally translated information. Some were unaware of the newborn SC carrier information leaflet produced by the NHS Sickle Cell & Thalassaemia Screening programme (available/issued during the study period in September 2007 in English) but those who had used this felt it was a good resource with well-targeted information. One informant using the national leaflet for CF carriers (available in March 2007) described how a number of parents felt this was confusing and over complex, and one

highlighted using her own in a more simplified form.

One or two [parents] have certainly said well they have got confused because [the leaflet] talks about CF then it talks about carriers and then it talks about CF and its like well oh what are we talking about... we have actually produced one with the same information but in a question and answer format. But I think the actual leaflet can be a little bit confusing when you're reading it.

(CF focus group participant)

They identified a critical lack of good or recognised information for use with parents when initiating the second blood test for IRT. One useful example of this was cited as provided by a screening laboratory.

There was a gap we felt within the national literature that there is... not something to cover that, that period [waiting for the second test result].

(CF focus group participant)

Our newborn laboratory issue the packs when they ring the midwife to organise a second sample they fax a letter to be given to the parents explaining why the second sample is being taken and certainly to begin with that was a problem where the letters didn't get to the midwife and the midwife didn't get to give it to the parent and that was a problem. Now the parents are getting that letter that does seem to ease their anxieties and they know that within 10 days somebody will contact them and it does give a contact number so sometimes they will ring the laboratory and say I want some more information.

(CF focus group participant)

Roles and support of different professionals in pathway

Generalist health professionals without specialist genetics expertise, such as midwives or health visitors, were perceived as having a valuable role in supporting communication of results because of their potential insights into relevant family information or parents' prior knowledge of the conditions.

Certainly as far as conveying the CF carrier results I do find it vital going with the health visitor because she has already had contact with the family, has got a picture of the baby and

she will link in with the GP's if there are any concerns, if parents are a little bit anxious.

(CF focus group participant)

However, there was some concern about non-specialists' competence to provide accurate carrier information, with respondents citing examples of parental anxiety following apparent misinformation in this context. They emphasised a need for training and support of non-specialists to answer basic screening questions, and prevent unnecessary parental anxiety. This included providing more specific written support for midwives or health visitors to use with both SC and CF information, and when second heel prick testing was necessary as part of CF screening. Some felt that expecting generalist professionals to assume more of a role, particularly discussion of CF carrier results, was unlikely to be feasible or appropriate given the relative rarity of these results in most professionals' practice.

I think from a clinical governance point of view... health professionals need to be armed with the correct information to give it to patients to prevent that anxiety.

(SC focus group participant)

One of the problems we had when we started off, midwives hadn't attended the CF training and they were being asked to do repeat tests and parents were being told all sorts of things by the midwives.

(CF focus group participant)

It's nice that it's someone familiar and obviously its got to be done in person to collect that second sample. But yeah more training would be good and I mean I think that's why maybe a leaflet that all midwives could have when they need to take out might be easier because it saves them from having to you know revise it every time it might happen and try to remember everything they've got to tell them. It might be one of the easiest solutions I think.

(Genetic counsellor, discussing CF screening)

Potentially a lot of them [midwives] might never do one of these you know not very often. So they really weren't that briefed exactly so you know how long it's going to take, what exactly it means, what are the chances it being an affected or a carrier. So the midwives often weren't able to answer their questions... I can imagine them running around whereas that is

my job and when I do call eventually I do have plenty of time to explain everything to them.
(Genetic counsellor, discussing CF screening)

(Haemoglobinopathy counsellor, high prevalence area, conveying SC results by letter with invitation to counselling)

Communication in ethnically diverse contexts

Participants highlighted the challenges they faced with the increase in SC carrier identification following newborn screening. They underlined how this amplified the need for greater support and investment, particularly in ethnically diverse areas of higher prevalence where potentially inadequate staffing levels were a concern. While existing nationally produced carrier information was useful, they identified a lack of availability of high quality translated information for use with parents in conveying SC carrier results. They also underlined the importance of being able to access and work with professional interpreters who had been appropriately briefed about the nature of the consultation.

I have been understaffed now from 1993 and since then our ethnic population has increased so there is an increased number of those that are carriers that you would find [...] The staffing hasn't increased to cope with that level of increase of both the antenatal and newborn screening.

(Haemoglobinopathy counsellor, high prevalence area, conveying SC results by letter with invitation to counselling)

We have had some leaflets come through, from the NHS programme and they are actually very good. They are sort of very thorough and specific ... [but] you don't have the information to help in the appropriate languages as well. We have difficulty in obtaining information in other languages because of the cost factor and there are limited resources for I think in most areas really certainly here where I work. You can't get money to obtain leaflets or have them translated in to other languages so that makes a difference.

(SC focus group participant, high prevalence area)

What I would usually do is tell the client it will take a bit longer but I need for the advocate to understand first. So I will go through it with the health advocate first, and if she has any questions first before translating. It just makes it a bit longer, but, I hope, a bit more effective.

Equity and consistency of communication

Health professionals involved in both SC and CF were concerned about regional variations in protocols for communicating results and poor consistency of messages to parents within regions when different professionals were involved. They suggested there could be closer adherence to national protocols with less variation both between and within regions to ensure services are equitable. In achieving this, respondents underlined the importance of provision of pre-screening information antenatally to enhance parental awareness and preparedness for possible results of newborn screening, and use of standardised national carrier information for parents in achieving this.

I think it would be helpful to know that actually in third trimester ..., we have talked about this, it has been done because in my experience where I have asked parents did your midwife discuss what this thing was and did she discuss it with you before she took the sample ... some of them can't remember it being discussed so ... that protocols being sort of broken down at the first hurdle because they haven't, not all of them have had that [pre-screening] leaflet or if they have they can't remember having had that.

(CF focus group participant)

If you went to different centres [services are] so different in every place and that makes it a bit iffy. We are specialists we must all be reading from the same book.

(Haemoglobinopathy counsellor)

It is a national screening programme ... obviously all areas are doing it differently ... and perhaps that needs sorting out you know.

(CF focus group participant)

I think we need the standard national leaflet, so you're giving the same information, because ... every centre does their own [information], ... I think it would make life so much easier, as it would make the information standard throughout.

(Haemoglobinopathy counsellor)

Health professional feedback from validation

Feedback from participants was invited on a written synopsis of the above key themes. Respondents confirmed this interpretation and felt it agreed with feedback they received from parents. The need for better guidance for health professionals, information for parents at the time of a repeat

sample in CF screening, and for support for parents between this and receiving results was emphasised. A need for further research exploring the scale and reasons for non-uptake of counselling among parents of SC carriers, and the potentially neglected service needs of this group, was identified.

Chapter 5

Views and experiences of parents receiving carrier results

Objectives

This central phase of the work sought to address the following questions:

1. What are parents' experiences and views of how they are informed and the support they are offered?
2. How well is carrier status information understood by parents?
3. What is the impact on a family of being informed of newborn carrier status, and is this information shared within the family?

Methods

Recruitment and sampling

Recruitment sites, and parents informed of their baby's CF or SC carrier status following universal newborn screening, were purposively sampled and selected according to experience of the range of differing models of communicating carrier status information in localities across all nine health regions of England during 2007 and 2008. This was initially informed by the identification of current or proposed approaches in the preliminary study with regional screening co-ordinators (see Chapter 3) and by further discussion with local health professionals involved in co-ordinating or communicating carrier results.

Following Multicentre Research Ethics Committee approval, study progress was impeded by widely varying local NHS R&D requirements and approval processes in over 30 R&D units serving Trusts that were selected across England. These local approvals were necessary before respondents could be approached with study information and invitation (average time from application to Trust approval of 11 weeks, range 1–42 weeks).

Following local Trust R&D approval, relevant local health professionals kindly distributed study information packs, on the study team's behalf, to parents who had recently received newborn carrier results. These packs included an invitation letter,

a three-page parent information leaflet, a 'consent to contact' form, a translation request form, and a freepost envelope. Parents who returned 'consent to contact' forms were then contacted by a researcher to discuss the study, and to arrange an interview if appropriate, with informed consent undertaken at interview.

Where parents returned a translation request form, a researcher called with a professional interpreter and a three-way telephone conversation was held to achieve this. Where possible, the same interpreter was used during subsequent face-to-face interview. Following interviews, parents were provided with an opportunity to ask further questions, and were told they would receive a letter thanking them for their participation, as well as a summary of the research with an opportunity to provide feedback and reflect on the study findings.

Data generation

Data were generated by face-to-face semi-structured interviews with a purposeful sample of 67 family members of 51 infants identified by universal newborn screening as carriers of CF (27) and SC (24).

Interviews were conducted in respondents' own homes, at their convenience, using professional interpreters where necessary (eight cases: French, three; Bengali, three; Portuguese, two), and explored how parents and their families had perceived, experienced, understood and adapted to the process of screening. Interviews took place between 3 and 7 months following screening. Parents were initially encouraged to relate their experience of newborn screening from the time they were first aware that their child was going to be screened. Interviews then followed broad topic areas based upon the research questions, using a topic prompt which was modified and refined following earlier interviews. Parents were encouraged to discuss their perceptions and experiences freely but were also asked to reflect on the effect that the screening information or process had had upon them and their families,

on their prior knowledge of the condition and on their understanding of the information they had received. Willingness to be approached again for later telephone interview as part of validation of findings was also sought (see below). All interviews were audio-taped and transcribed verbatim.

Interviews conducted with the support of professional interpreters were initially transcribed in English. These transcripts and original interview recordings were then checked by an independent interpreting and translation service for accuracy of translation of all parties by interpreters within the interview, and for equivalence of meaning.

Data analysis and validation

Data generation and analysis were iterative, with each informing the other using a grounded theory approach. Constant comparison of data was undertaken by project field researchers (health psychology and social science backgrounds), with the wider team (clinical primary care academics) contributing to development of the analysis and conceptual framework to maximise theoretical sensitivity. Organisation and coding of data were assisted by the use of NVIVO software. Further theoretical sampling and data collection sought deviant cases to extend and challenge earlier data and interpretation until no new categories or concepts emerged, suggesting saturation.

This was followed by a phase of respondent validation (member checking) with parents. All participating parents were sent and invited to comment on an interim summary of findings, translated where appropriate, towards the end of the study. Further semi-structured audio-taped telephone interviews were conducted for respondent validation with one third of the sample (parents of 17 newborn carriers) between 3 and 14 months after their earlier interview. These interviews also invited further reflection on parents' experience with the greater passage of time since being informed of their child's carrier result. These data served to confirm and refine our analysis.

Description of sample and context

The national purposeful sample of participating parents included 49 mothers and 16 fathers, with an average age of 34 (range 18–47) years, and one maternal grandmother and one maternal grandfather. There were no significant demographic differences between parents of CF or SC carriers other than ethnicity. They are

described in *Table 4* and their infants' carrier status is described in *Table 5*.

Parents' experience of different ways of communication of information and results following screening, with those health professionals involved, and other contexts is also summarised below in *Tables 6* and *7*.

In relation to potential awareness or knowledge of carrier status among the sample prior to newborn screening, 21 parent respondents knew their own SC carrier status previously from antenatal or other earlier testing, and there was a family history of being affected with sickle cell disorder in one family (previous child). Five parent respondents had been tested after their newborn was identified as a carrier for SC. Among parents of CF carriers, three knew of their own CF carrier status previously and there was a family history of CF in one family (parent's sibling); while 19 of 35 other parent respondents had had carrier testing after their newborn was identified as a CF carrier.

Results

What are parents' views of how they are informed and the support they are offered?

Influences on experience of communication of results

Respondents' views reflected their varying experience of communication across a screening pathway rather than a discrete communication event. In summary, factors shaping their positive or less positive experience across both conditions were:

- their prior knowledge or preparedness for carrier results
- processes used to contact parents, such as how initial contact after the heel prick test was made, or whether information was conveyed with both parents present
- the competence, knowledge and communication of health professionals involved in pathways rather than the type of professional
- opportunity for access to in-person communication with a well-informed professional
- the provision of timely, accessible and accurate information before and alongside testing (what for, what to expect), and when receiving

TABLE 4 Characteristics of national sample of parents of newborn carriers (N=67)

Characteristics of parent respondents ^a	n (%)
Ethnicity	
White British	43 (64%)
Black African/British/Caribbean	14 (21%)
Bangladeshi	3 (4%)
White European/Other	3 (4%)
Mixed	3 (4%)
Asian Thai	1 (1%)
Employment Status	
Employed full-time	33 (49%)
Employed part-time	12 (18%)
Full-time parent	11 (16%)
Full-time student	3 (4%)
Full-time carer	1 (1%)
Unemployed	1 (1%)
Not known/completed	6 (9%)
Highest educational attainment	
Degree or higher degree	22 (33%)
NVQ, Diploma, A level, HND or equivalent	17 (25%)
GCSE or equivalent	14 (21%)
None	1 (1%)
Not known/completed	13 (19%)
Parent carrier status	
Not tested	19 (28%)
Tested – carrier SC	17 (25%)
Tested – carrier CF	11 (16%)
Tested – not carrier CF	11 (16%)
Tested – not carrier SC	9 (13%)

a Includes two grandparents.

results (what they mean, signposting to further information)

- availability of relevant information, and continuing guidance after receiving results.

Ways of being informed

The varying ways in which parents in the study experienced being informed of their child's carrier status are described in detail in *Tables 6* and *7* below. Parents whose child was a carrier of

TABLE 5 Characteristics of carrier infants (N=51)

Characteristics of infants	n (%)
Infant carrier characteristics	
Carrier of CF	27 (53%)
Carrier of SC/other haemoglobin variant	24 (47%)
Female	24 (47%)
Male	27 (53%)
Birth order of infant	
First	28 (55%)
Second	17 (33%)
Third	6 (12%)
Family units	
Mother lives with baby's father	43 (84%)
Mother lives with partner	1 (2%)
Single parent household	7 (14%)

SC commonly either received a letter informing them that their child was a carrier and/or inviting them to attend a clinic with a haemoglobinopathy counsellor, or they received a home visit or telephone call from their health visitor informing them of the carrier result. In contrast, parents of infants who ultimately were found to be carriers of CF were often first made aware of the necessity for further heel prick testing when a health professional (midwife or health visitor) visited their home unexpectedly. Some were informed by telephone that this was necessary, including by answerphone message. Subsequent carrier results were then conveyed in one of three ways: most commonly in a home visit from, or a hospital appointment with, a health professional with specialist screening, genetics or CF expertise; less commonly by a telephone call alone from the latter; or, also less commonly, by a home visit involving the latter accompanied by a 'familiar' primary care based health professional (health visitor or midwife). No respondents received CF carrier results by letter.

Receiving SC carrier information

Parents of SC carriers who had some prior knowledge of carrier status generally, or their own carrier status from previous or antenatal screening, appeared more prepared for, and were generally satisfied with, how their child's results were communicated. For example:

TABLE 6 Communication of SC carrier results experienced by parent sample (N=29)

Communication of SC carrier results experienced	Parents, n (high/low prevalence area)
Haemoglobinopathy counsellor	14 (11 high/3 low)
Letter (result), health centre consultation offered and taken up	6 (4 high/2 low)
Letter offering appointment, health centre consultation (result)	5 (high)
Letter alone (result)	2 (high)
Telephone call (result), advised to consult GP, second telephone call from haemoglobinopathy counsellor	1 (low)
Health visitor	7 (2 high/5 low)
Home visit (result)	3 (low)
Home visit (result), further home visit from specialist screening counsellor	1 (low)
Home visit (result), GP visit, telephone call from haemoglobinopathy counsellor	1 (low)
Telephone call (result)	1 (high)
Telephone call (result), home visit	1 (high)
Screening link health visitor	4 (1 high/3 low)
Letter (result), home visit with family health visitor	2 (low)
Telephone call (result), home visit	1 (low)
Telephone call (result)	1 (high)
Specialist screening counsellor	3 (low)
Letter (result), home visit	3 (low)
Midwife	1 (low)
Home visit (result), GP consultation	1 (low)

She (haemoglobinopathy counsellor) was the same person that actually dealt with me when I was pregnant and so she did actually say, ... 'Oh next time I see you it will probably be me that tells you (my baby's) got the trait.'

(#28: Mother of SC carrier, result in letter, saw haemoglobinopathy counsellor; high prevalence area)

Interviewer: Were you worried when you saw what the letter said?

Parent: Not really because they said 'only a carrier' and I am a sickle cell carrier as well so I wasn't that surprised.

(#47: Mother of SC carrier, aware of carrier status from childhood blood test; high prevalence area)

However, most parents had not felt prepared for the possibility their child could be a carrier, and, without this prior knowledge, were less comfortable with some aspect of how they were informed. This included receiving results by letter

or their communication from health professionals who appeared to lack adequate knowledge or competence, when subsequent contact with well-informed professionals became important. For example:

Yeah I was still unsure [after reading letter with results] and I still didn't feel, yeah, I didn't feel good about it no.

(#34: Parent of SC carrier, low prevalence area, not tested antenatally)

She [midwife] came in and she was like 'can you sit down' ... I thought 'oh right that's it, he has got cancer or AIDS or something' you know, oh it was awful ... I immediately went in to kind of panic where 'right what's wrong, tell me, tell me?' [She said] 'Come on let's just be calm' and I was like 'no you can't do that, you can't do that to somebody and then say now be calm ...'

(#63: Mother of SC carrier, low prevalence area, not tested antenatally)

TABLE 7 Communication of CF carrier results experienced by parent sample (N=38)

Communicating need for/performing second heel prick test	Communication of CF carrier result	Parents, n
	Specialist screening nurse	12
Midwife telephone call, home visit	Specialist screening nurse telephone call, home visit (result)	5
Midwife home visit	Specialist screening nurse telephone call, home visit (result)	2
Specialist screening nurse telephone call, health visitor home visit	Specialist screening nurse telephone call, home visit (result)	2
Specialist screening nurse telephone call, midwife home visit	Specialist screening nurse telephone call, home visit (result)	1
GP telephone call, midwife home visit	GP consultation (result), specialist screening nurse telephone call and letter	1
Interviewee cannot recall	Specialist screening nurse telephone call, home visit (result)	1
	CF specialist nurse	6
Midwife home visit	CF specialist nurse home visit (result)	2
Midwife home visit	CF specialist nurse hospital consultation (result)	1
Midwife answerphone, home visit	CF specialist nurse and consultant hospital consultation (result)	1
No second test taken	CF specialist nurse home visit (result)	1
Health visitor home visit	CF specialist nurse telephone call (result)	1
	Hospital consultant	6
GP during consultation, CF nurse and health visitor home visit	Hospital consultant clinic (result)	2
Midwife telephone call, home visit	Hospital consultant clinic (result)	2
Midwife home visit	Health visitor (child carries one gene), hospital consultant (incorrectly informed child affected before confirming carrier status)	2
	Specialist counsellor	5
Midwife telephone call, home visit	Specialist counsellor telephone call (result), home visit	2
Midwife telephone call, home visit	Specialist counsellor telephone call (result), specialist counsellor and health visitor home visit	2
Interviewee cannot recall	Health professional (unclear who) telephone call (result), specialist counsellor home visit	1
	CF nurse and 'familiar' health professional	4
Midwife telephone call, home visit	GP telephone call (result), CF nurse and health visitor home visit	2
Midwife home visit	CF nurse and midwife home visit (result)	2
	Genetics counsellor	3
Midwife telephone call, home visit	Genetics counsellor telephone call (result), hospital consultation offered but not accepted	1
Midwife home visit	Genetics counsellor telephone call (result), hospital consultation offered and taken up	2
	Screening midwife	1
Midwife telephone call, home visit	Screening midwife telephone call (result)	1
	Screening link health visitor	1
Health visitor telephone call, home visit	Screening link health visitor telephone call (result), home visit	1

a Risk of CF identified antenatally, sweat test conducted.

[The specialist counsellor] came out and talked to us and she was brilliant. She explained everything about it to me, you know, she was here for about an hour and explained everything about it. You know, the implications for [name of baby] and you know talked to me about, you know, when I should talk to him about it.

(#35: Mother of SC carrier, initially informed by health visitor, then by specialist screening counsellor, in low prevalence area, had been tested antenatally)

Parents of SC carriers reported distress when they were left feeling unsure about whether their child was a carrier or had the condition. Examples included anxiety being triggered by letters which asked parents to attend a clinic appointment without explicitly stating that their child was a carrier. For example:

Parent: Well I was thinking you know, has he got sickle cell anaemia? [on receiving letter offering appointment but not containing information on result]

Interviewer: Because you were already aware of your partner's ...

Parent: Yes yes, I mean I knew that he shouldn't be able to have it because I'd been tested before with our daughter. But even so it was just ...

(#28: Father of SC carrier, invited for appointment, carrier result later given in person by haemoglobinopathy counsellor, high prevalence area)

In contrast, parents underlined how making a first communication highlighting their child was healthy and not ill before any further communication was made could immediately assuage untoward concerns. For example:

The only drama was the beginning part where she (midwife) didn't start it by saying right we have got your results and there is something that might be a little bit disturbing to you but I just want to say that there is nothing to worry about – that could possibly have been better.

(#63: Mother of an SC carrier, low prevalence area)

I think as long as you're telling people straight away 'This doesn't mean your child's going to be ill', that's what they want to know really,

that's what's important and then to give them all the information later, but as long as people are reassured that their child's not going to be ill I don't think it should cause that much stress really.

(#35: Mother of an SC carrier: informed by a specialist counsellor, following initial reassurance by health visitor, low prevalence area)

However, the challenge of negotiating more generic barriers of communication featured for others parents. Letters that clearly stated their child was a carrier still caused concern if parents could not understand the letter, because of poor literacy or need for translation. For example:

Their uncle read the letter for them and when they heard it they were really upset, ... he [father] knew there was some problem with his son. There was a problem but they did not know [what it was] so they were really upset.

(#1: Parents of an SC carrier, via interpreter, Bengali, high prevalence area)

... and then she received a letter saying that she had to come to [name of health centre] because we have found something in your baby's blood. So she took her aunty with her who knows English so she went with her to meet [haemoglobinopathy counsellor] and [she] explained everything. She was very worried the first time because she could not understand much.

(#2: Mother of an SC carrier, via interpreter, Bengali, high prevalence area)

For parents with these needs, health professionals conveying and discussing carrier results in person appeared essential for effective communication (see Opportunity for access to health professionals in person).

Experience of CF screening and communication

The experience and satisfaction of parents of CF carriers, involving more steps and health professionals in the pathway, were more variable than for parents of SC carriers. Around half of these respondents reported experiencing considerable stress at some point, relating this to lack of information or poor health professional knowledge and communication, especially concerning their child needing to have a second blood test for IRT.

Health professionals could appear variously uninformed about the screening process or about the implications of screening results, which created concern and distress for parents. Some respondents queried if health professionals (usually midwives, sometimes health visitors) taking the second heel prick test had received adequate training to deal with parents during the process and to communicate within it. (The current national protocol states that screening laboratories should inform midwifery services that a second newborn blood spot is required because ‘further tests need to be done for cystic fibrosis’.) For example:

There were two issues – one was [the health professional did] not have sufficient information to have the conversation and the other was the way in which the information was conveyed.

(#4: Father of CF carrier. Mother first received answer telephone message saying ‘there had been a problem with the heel prick test’. When she rang back she was told that ‘the test for CF had come back positive’. She asked her midwife for more information who responded that she had not received training, but just needed to do the second heel prick test urgently.)

She just said there was a problem with the first test. But I said ‘oh what sort of problem?’ and she just said ‘sometimes they don’t get enough blood and they have to re-do it’ so she didn’t really say, you know.

(#22: Mother of a CF carrier, describing discussion regarding second blood test with midwife)

Some parents felt they had not been provided with enough information, support or time to fully understand the likely outcomes of the second test when it was first indicated as necessary, with resultant anxiety and distress in the interim. For example:

Father: She wept on my shoulder I think.

Mother: And then we were cross. [...] Cross about the fact that somebody could have saved us all that anguish just by at the off-set saying ‘Don’t worry; she might just be a carrier’.

(#23: Parents of CF carrier)

Receiving an unexpected or urgent home visit for the repeat heel prick test, or for later results of the second blood test could be problematic for parents. In both situations many parents, and extended

families, in the absence of accurate information about the screening process or how results would be communicated, had interpreted the need for a visit at home as inevitably indicating a serious problem (need for second test), or that their child was affected with CF (visit with results). For example:

I was like ‘There’s nobody due till next week. You winding us up?’ [The health visitor] put the phone back to [my partner], I was on the bus I had tears streaming down my face ...

(#37: Mother of a CF carrier describing receiving a telephone call asking her to come home as two health visitors had arrived – for repeat heel prick test)

[The telephone call informing us that the heel prick test had found something] obviously came as a shock – very emotional for both of us. [...] And obviously as soon as you mention a condition you start going into panic mode. So we spent the next sort of hour or so while we waited for the midwife to come round, basically in tears really wasn’t it? Really distraught and I think it was the midwife that it was actually mentioned on the phone again ‘Well you know you’ve been discharged, well actually there’s a problem with your result’ and then ‘cystic fibrosis’ is the next thing that comes out of her mouth and obviously you start thinking the worst.

(#50: Mother of CF carrier, first child, describing being approached for repeat heel prick test)

I was 5 hours away then and I had to drive home from work trying to see where I was going through the tears.

(#50: Father of CF carrier, on hearing a health professional was coming to the house, with results of second heel prick test)

Mothers found this experience even harder if their partners were unavailable, not only because they had no support, but also as they were left to communicate the information to the baby’s father themselves. This occurred most commonly with second IRT testing but also when mothers received carrier results. One mother suggested that simply providing more adequate information about how information and results would be reported could have alleviated distress.

Most parents of CF carriers had not felt prepared for the possibility their child could be a carrier.

Although some parents had concerns about communication of the carrier result (following the second heel prick test), most were very positive about their experience of its communication by professionals with appropriate knowledge. Those respondents with unsatisfactory experiences related this to poor communication by professionals, including insufficient flexibility or support, and a lack of timely access to relevant information rather than the discovery of their child's carrier status per se. For example:

She [specialist screening nurse] rang up in the morning and said 'I'm coming out to give you the results' so I said 'Can't you give them me over the phone? You know we've been waiting for ages, it seems like' and she said 'No I need to come out, that's just company policy. I need to come out and see you because you were so worried and anxious about it, I do want to explain things clearer on paper to you.' But she wouldn't say he hasn't got it [affected with CF] on the phone or anything.

(#56: Mother of a CF carrier)

I don't like to be ..., but she [screening nurse] wasn't very helpful ..., I think she thought well 'you are not planning on any children at the moment so don't worry about it.' I got that kind of impression but I have been worried for the past year.

(#21: Mother of CF carrier)

Seeking web-based sources of information

Experiencing a relative 'information vacuum', parents actively sought additional information, most commonly from the internet, and often immediately after receiving a letter or talking to the informing health professional. This could be helpful and reassuring for parents of SC carriers, with relevant information found fairly easily. For example:

We looked at each other and after [receiving a letter informing SC carrier] we went on the internet that's when you know things started calming down because it said a bit about it ... If we didn't have the internet to find out it was going to be, you know, an emotional wreck completely ...

(#53: Mother of SC carrier, low prevalence area)

I typed it in on the internet and then I wasn't too worried because I realised that he was a

carrier so it wasn't that bad ... I think 5 minutes just to see a little bit more about it [...] I just had a look about being a carrier state and also had a look about what the disease could be because obviously he is going to need to know.

(#52: Mother of SC carrier, high prevalence area)

Relevant web-based information on carrying CF was found to be much less readily available. This was often sought when the need for a second test was raised or the result of this and seeing a professional was awaited. Parents typically found information designed for those with affected children rather than carriers. This appeared significant as it could exacerbate parents' concern. For example, noting information about symptoms, parents found themselves assessing their child for them, creating ongoing doubt about their child's health. For example:

[I] just typed in 'Cystic Fibrosis' really and ... (it was the) worst thing I ever did.

(#56: Parent of CF carrier)

You're left alone and you don't know much about CF, you've never heard of it really, it's not talked about too much. So you go [to the] internet don't you and have a look and that little bit of knowledge is probably the worst thing you could possibly do.

(#40: Mother of a CF carrier)

Father: Of course obviously we thought worst case scenario and [name of baby] was full of cold.

Mother: She had all the symptoms.

Father: Really mucousy and everything and so we obviously thought ...

Mother: And also lactose intolerant, so all the milk was going straight through her ...

(#23: Parents of CF carrier, child

subsequently referred to hospital because of concerns that symptoms suggested CF)

... it just felt odd didn't it? Very strange because she looked so healthy and we were saying 'If she's got cystic fibrosis surely she wouldn't be so healthy?' But unfortunately she's had a few breathing difficulties when she'd first been born.

(#40: Mother of carrier of a CF)

Role of health professionals

Respondents highlighted that professionals involved in screening communication should be

familiar with the screening process and sufficiently trained to provide relevant information and respond appropriately to parents' questions. In relation to SC, community-based professionals in primary care likely to be more familiar to parents, in particular health visitors, but also midwives and GPs, were involved in communicating carrier results to a third of families interviewed either directly by themselves or in combination with another professional with more specialist screening or SC knowledge (see *Table 6*).

While midwives or health visitors were consistently involved in second heel prick testing, primary care based professionals featured much less commonly in communicating CF carrier results in our sample. In these four cases they were involved in combination with another professional with specialist screening or CF knowledge (see *Table 7*). Parents in relation to either condition emphasised professional competence and were not overly concerned about what type of health professional conveyed results. For example:

I went to the GP [...] and the GP was very good. She said, she told me a bit more about it and gave me some information.
(#13: Mother of SC carrier, initially informed by health visitor, then sought GP for additional information)

I thought you [researchers] were going to come up with either one or the other [health professional to recommend] and I was going to say actually it doesn't make any difference it could be a complete stranger, but as long as they have got information or answers to somebody's questions that is the thing that matters.

(#62: Mother of CF carrier, respondent validation interview)

Although some parents felt that primary care based health professionals may not have sufficient expertise in SC or CF screening, some nevertheless pointed to the advantages of a health professional more familiar with the family being involved in the process of communication of carrier information.

The health visitor is probably the best person because even though she sees so many [families] she has got more of an idea about each person hasn't she?

(#52: Mother of an SC carrier, high prevalence area)

The difficulty with being told news by somebody who doesn't know you is that they have no psychological basis for understanding how your reaction will be, what your reaction will be.

(#63: Mother of an SC carrier, low prevalence area)

She [health visitor] said 'I can't believe you didn't wait for me' [meaning other health professional communicating carrier results] – she went 'I've met the family, I know them, I can't believe you just went straight in'. She came to see me afterwards... If she'd been there I'd have put the kettle on, it would have been easier.

(#37: Mother of CF carrier)

Opportunity for access to health professionals in person

Parents of SC carriers with prior knowledge of carrier status, in particular their own through antenatal testing and counselling, placed less importance on need for communication of their baby's results in person than by telephone or letter. However, the opportunity for face-to-face interaction was important for those without such knowledge or where English was not their first language. For example:

I was a bit shocked, concerned, like if anything is going to happen to her or anything... when I read further down that she is not going to be affected I was still like a bit iffy until when I went... and I got a bit more information I was reassured.

(#30: Mother of SC carrier, initial result by letter then saw haemoglobinopathy counsellor, high prevalence area)

The health visitor came to her house... with me [interpreter]. [She] explained really nicely what it was, and when baby will grow up and get married what he has to be careful about and what he has to do. So now she is really clear on everything.

(#2: Mother of SC carrier, via interpreter, initial result in letter, used relative as interpreter with haemoglobinopathy counsellor in clinic but still had concerns, further home visit from health visitor with trained professional interpreter helped address concerns, high prevalence area)

There was a problem but they did not know what so they were really upset [after receiving letter]... but when they meet them [haemoglobinopathy counsellor] then everything was cleared.

(#1: Parents of an SC carrier, via interpreter, high prevalence area)

First, they got the letter, they didn't understand anything. They went to the clinic... the interpreter called again to explain that he had the genes.

(#11: Parents of an SC carrier, via interpreter, Portuguese, low prevalence area)

For almost all parents of CF carriers, access to personal interaction with a well-informed professional was sought, preferably from the point of becoming aware of the need for a second test. When this occurred – typically with a health professional with specialist screening, genetics or CF expertise – and parents felt fully informed of the implications of this test result, then receiving subsequent results via a telephone call for more rapid delivery could be acceptable. When this had not occurred, subsequent interaction with an appropriately informed professional was particularly important.

Grandfather: As soon as they test for cystic fibrosis (referring to second heel prick test) they should have an expert on hand... To give you some idea of what's going on. Somebody in the area who's really clued up on it and sit down and explain to people what it is.
Mother: If not you just jump to conclusions don't you.

(#39: Family members of CF carrier)

Mother: ...it was a quite short conversation, it was literally this is [the name of the hospital] and your results are back for your daughter and she is a carrier of cystic fibrosis. I think he just told me immediately... and then he just said 'right oh she isn't actually affected she is just a carrier' and I think he asked a couple of questions and that was it. Because I think we knew most of the stuff then.

Interviewer: So at that stage would you have wanted any more information or...?

Mother: Erm I don't think so because I think we had already got the information we needed or felt we needed.

(#62: Mother of CF carrier)

Then after that [referring to poor communication at time of repeat heel prick test] we saw [name] and she was able to answer a few more of the more complicated questions I guess... Yes and I think we needed somebody who was, who knew that much about the whole thing to allay our fears and just to sort of help it.

(#65: Mother of CF carrier, informed by genetic counsellor)

Reducing unnecessary waiting in the system, in screening for either condition, with prompt delivery of results by an informed professional was particularly valued. For example:

[She] phoned us the next day because she didn't want to leave it over Christmas so I was really... I really appreciated that.

(#28: Mother of SC carrier, informed by haemoglobinopathy counsellor)

I think there was enough support, I think they worked as quick as they could get us the news to giving us the full result they worked as quick as they could.

(#58: Father of CF carrier, informed by screening nurse counsellor)

Information needs

Parents sought open, timely and honest information. They needed to know what tests were happening, why, what would happen next, when they would receive results and what the likely outcomes might be. Parents of both SC and CF carriers wanted more information at the initial stages of screening (e.g. before screening tests were performed, when being informed the initial screen for CF had identified need for a second test) rather than waiting until they received the carrier result.

... obviously to us this [test result] was the most important thing ever and we were just continuing to sit and wait and you just feel completely helpless. [...] It's quite horrible. I do think if there is more about the actual process and procedure and why you have to have a second [heel prick] test repeated and things like that would be quite helpful.

(#50: Mother of a CF carrier)

Some recognised this had clearly been a challenge for midwives unused to negotiating the uncommon situation of a second heel prick test for CF screening in their routine practice. For example:

... it wasn't till afterwards that erm that I then realised she [midwife] was put in a difficult position and she didn't know quite what to say to me. But I would have liked the truth; ... because obviously when I got the [carrier] result it shocked me – I was quite shocked.

(#7: Mother of CF carrier describing how she had not been informed second heel prick testing was for CF)

... I did feel for the midwife ... because I mean she kind of, she didn't really seem to understand the ins and outs of it either which of course must have felt a difficult situation for her [...] I felt that part of that was perhaps her inexperience in dealing with that situation [second heel prick test in CF screening]; she kind of seemed as baffled as I was.

(#15: Mother of CF carrier, respondent validation)

Some parents of SC carriers had found themselves feeling misinformed because the period during which they had been told to expect a result had elapsed without them receiving a result, and so they assumed nothing had been found on the heel prick test only to subsequently be informed that their child was a carrier. Parents did not find it helpful, therefore, to be told 'if you don't hear anything then everything is OK' but rather felt all parents should be actively informed if there were a 'negative' result. For example:

I was really upset because I had not got the call ... erm the health visitor said that [if] you don't hear from them it is good news. I didn't worry about the rest of the things [other conditions screened for] but not sickle cell please and when I got the call from [name of counsellor] I thought 'oh 6 weeks had gone where have you been all that time, I thought we were free now.'

(#10: Mother of an SC carrier, low prevalence area)

A quarter of parents had not received additional written information about their child's carrier result. No parents of CF carriers but a small number of parents of SC carriers (five), were informed of results before national programme specific CF or SC carrier leaflets became available (February and September 2007 respectively). Other written information for SC carriers, such as that from ApoGI, has been available since 2000. However, most parents who had received such

information, in various forms, including national programme specific leaflets about carrier results found these useful as a reference for key points, and for discussion within their families.

She took about 20 minutes to do this because she explained it all and wrote it out. She was a little bit embarrassed that it was the way she explained it there was no proper leaflets or anything.

(#59: Mother of an SC carrier, low prevalence area, informed in 2008)

It is quite well written [CF carrier result leaflet] it just takes you a few sections like what is CF, what does being a carrier mean all of that. I think it's very clear you can't confuse it.

(#58: Mother of a CF carrier)

Yes definitely I have, erm, [name of counsellor] gave us these leaflets which has got a whole page about all the sickness.

(#10: Mother of an SC carrier, low prevalence area)

Some parents felt written information provided lacked sufficient detail while others felt it was too complex to understand, some could not read it, and others found it had a surfeit of antenatal and postnatal information at a busy and stressful time.

And the thing is how the [newborn screening] leaflet from how I recall, it starts off with conditions which are very very rare in the first place and it's not until you get sort of half way through that you end up with anything to do with CF and yet there's one in 25 people that are carriers and I think maybe if it was highlighted to people, 'This is the test that's going to be looked at, it does affect a lot of population, and it's worth reading through it.'

(#50: Mother of a CF carrier)

One thing that the midwife didn't do, and the [newborn screening] leaflet didn't until you went back and reread it three times was saying that it could be carrier status. Because of course it doesn't say that unless you read the small print at the back.

(#23: Mother of a CF carrier)

Most respondents underlined how opportunity for additional personal communication with a professional who was well informed was helpful to discuss results in more depth and to answer their

queries. In addition, the particular need for an information leaflet at the time of the second blood test for CF was emphasised.

You don't really want a leaflet shoved in your face yet again. We have had so many leaflets whilst we were pregnant just to have another leaflet isn't the greatest of things obviously it does answer some questions but you do have your own questions and it is easier to fire them at somebody if somebody is sat there and can really tell the whys and why nots and so on.
(#62: Mother of a CF carrier)

Whereas I do think if there was ... if you were given a leaflet when you needed a test repeated and 'This is the process that you will go through.' I think for me that would have made so much difference.
(#50: Mother of a CF carrier)

Continuing support and signposting of information

Respondents valued or sought details of someone who could provide further support and answer their questions. They underlined how this should be available to parents as soon as they are aware of the need for further testing or clinic visits, in addition to following communication of the results. For example:

I thought I was being over-cautious and everything at the time but [the screening nurse counsellor] sorted all that out for me and then she rang me I think a month later and said 'How's it going?' she was really helpful.
(#56: Mother of CF carrier)

In particular, they had found support on discussing carrier information with their families and, considering testing of themselves and families to be lacking, they sought specific information and guidance (see What is the impact on a family of being informed of newborn carrier status?). Parents wanted health professionals to recommend trusted internet sources of further information. For some parents, the opportunity for contact with other parents with experience of screening was suggested as potentially helpful.

But if the health visitor came and said 'Right this is what you're going to go through and if you want to talk to somebody about it, these people [other parents with similar experiences] have said they will talk to people, go round

for a coffee or whatever.' That might make the difference.

(#37: Mother of a carrier of CF)

He said that is a very good idea ... For him it was the first time to hear of this and to be given this information [about SC carrier status of his child]. It is better to know people ... in the same situation and how they live and how they manage it. It is a very good idea and he is supporting that.

[#18: Father of SC carrier (via interpreter – three-way telephone interview), low prevalence area (respondent validation)]

How well is carrier status information understood by parents?

Understanding SC carrier status

Most respondents had some degree of awareness of what sickle carrier status meant based on their experience or, in some cases, based on a level of general awareness of sickle cell within their community. Parents who were already aware of their own SC carrier status at the time of receiving their child's result often mentioned how this reassured them about the benign nature of the result.

Interviewer: Were you worried when you saw what the letter said?

Mother: Not really because they said only a carrier and I am a sickle cell carrier as well so I wasn't that surprised.

(#47: Mother of an SC carrier, high prevalence area)

Some parents felt the topic of sickle cell did not feature adequately in health or other media, while others recognised they had received information antenatally about screening but had not absorbed this properly. Following being informed of their baby's carrier status most parents had understood the 'benign' implications of carrier status and that it may impact on future reproductive decisions. However, reproductive risk was understood with varying accuracy and parents' knowledge and understanding could remain at a superficial level.

I did understand that he couldn't get the disease ... He's not going to be ill, you know ... it's basically, ... when he wants to have children himself and that he needs to know the status of the person that he has children

with and that you know it's obviously more important because if he, as I understand it, if him and somebody else who's a carrier had a child, I think it's something like, if I remember the statistics, a 50% chance of them having a child with sickle cell, or it might be 25% chance and a 25% chance of them having a child that's got nothing and a 25% chance of them having a child that's a sickle cell carrier. So you know it's quite a big risk really considering that sickle cell is such a terrible thing to have.

(#35: Mother of an SC carrier, father previously identified as a carrier, low prevalence area)

Discussing carrier status, or sickle cell disorders more generally, some parents had misconceptions or misplaced beliefs. Examples included perceptions that birth order or birth weight may determine carrier status; that parental carrier status automatically confers carrier status to the child; that carriers cannot donate blood; and that sickle cell is a disease confined to black people. Respondents who had encountered others affected with sickle cell disorders, often in Africa, remained unclear how people got the disease or what the implications were, and this could be associated with stigma.

Like if you got the sickle cell trait like I've got, it's not really like a bad, like what did I say, like disease or something ... but if you got like sickle cell disorder it is more bad.

[#47: Parent identified as a carrier during childhood, and antenatally, high prevalence area (parents often used the term 'trait'; this is a term used interchangeably with 'carrier' when referring to sickle cell)]

[My dad] made sure [of] that, he said that you had to make sure that you don't marry somebody who has an S [meaning the condition]. So when I was told that I had a trait I was very shocked and even when I told him [her father] he didn't believe it.

(#3: Mother of an SC carrier, high prevalence area)

[My husband] does believe that there are some minor symptoms so he for example gets quite bad leg pain when running and on exertion and he thinks it is something to do with the oxygen gets there.

(#55: Mother of an SC carrier, husband is a doctor and SC carrier, high prevalence area)

Some parents understood that being a carrier had advantages – for example, being an SC carrier offering some protection from malaria:

I was told that sickle cell is the body's way of preventing malaria

(#10: Mother of an SC carrier, low prevalence area)

I found it quite hard to understand how this develops when we talking about it you know it could be sort of protects you from malaria and I found that quite fascinating because I found thinking it protects you from malaria but on the other hand it is wiping out the community in future generations.

(#34: Parent of SC carrier, low prevalence area)

... and I understand there are some positives to it, like it offers him some protection from malaria and things like that, so there's some positives.

(#35: Mother of an SC carrier; low prevalence area)

He [GP] told me a very interesting fact which [partners name] had forgot to tell me – it actually makes her, it is a protective factor to malaria.

(#55: Mother of an SC carrier, husband is a doctor and also a carrier, high prevalence area)

Understanding CF carrier status

Following communication of their child's CF carrier result, most parents understood the central messages that their child was healthy, did not have CF, and that carrier status had implications for future reproductive decisions. Some parents found that subsequently establishing that they or their partner were also carriers provided them with their own evidence of how carrier status had no adverse health implications. However respondents highlighted that general community awareness and levels of information about CF were low.

Being a carrier isn't going to kill him so, whereas having cystic fibrosis is quite bleak isn't it?

(#20: Mother of a CF carrier)

With things like cystic fibrosis it's not something that you've actually seen much about so you don't know what the implications are.

(#40: Mother of a CF carrier)

[It's] something that you just don't hear a lot of people talking about.

(#12: Mother of CF carrier)

While the minority of respondents who had personal experience of CF in their extended family or other networks had a heightened awareness of the condition, reproductive risk and carrier status, there also appeared to be little evidence among other parents of stigma or inaccurate beliefs associated with CF. Some parents were knowledgeable about CF, for example describing how it affected the lungs, pancreas and digestion; that treatments included physiotherapy; that it can result in a reduced lifespan/that it is an illness people can live with; and that it can lead to a failure to thrive. However, like parents of SC carriers, there remained some variation in depth of knowledge.

Parents of 11 carriers of CF in the study sample mentioned the residual risk that their child may indeed have CF (it was considered unethical to approach this issue directly with parents during interviews unless it was raised by parents themselves). Nine of the 27 newborn carriers of CF in the sample had also undergone sweat testing according to variations in local policies, or following parents' concerns they were developing symptoms because of respiratory infections. All were confirmed to be unaffected, which had removed uncertainty for their parents.

I would explain to him that he would never ever have cystic fibrosis; I mean not a chance that he is going to have it.

(#7: Mother of CF carrier, negative sweat test)

For other parents, the residual risk appeared to be perceived with equanimity in the context of their child's good health or experience of their own carrier status.

I don't really think it's anything for us to be concerned about. OK there may be a possibility that she could have a rare form of CF but she's a perfectly healthy child, more healthy than most of her friends at the moment so you just have to live on the basis that she hasn't got it.

(#4: Mother of a CF carrier, first child, informed by specialist screening counsellor)

When they came back with the second heel test I would have just said oh well she is a carrier

same as me but because you have got that figure like you say they can't say 100% so you can't change that.

(#16: Mother of CF carrier, informed by screening nurse counsellor)

What is the impact on a family of being informed of newborn carrier status?

Knowing carrier result

With the exception of one parent who was uncertain, all parents interviewed felt it was important they had been informed of their child's carrier result. This was regarded as valuable new information about, and for, their child gleaned without additional tests. Most parents were not concerned or distressed by the carrier result per se. Most recognised this was not 'bad news' and had no direct adverse effect on their child. Some parents felt positively reassured when they heard their child was a carrier, particularly those parents awaiting the results of a second blood test for CF, who had worried about their child being affected by the condition.

I don't think [parents] should be upset about this, it is very important not just for them, but for the child involved as well.

(#3: Mother of an SC carrier, high prevalence area)

I am happy to know it, because it didn't involve any additional tests you know which is always nice for a little baby and it's, I think, it is valid information. [...] You know I could even argue that there is a need to know it, but it is certainly is I think it is good to know it.

(#33: Mother of an SC carrier, low prevalence area)

When they said she didn't have it [affected with CF] I was away, that was it, I'd closed down, that was fine [...] for me it was like 'I can switch off now.'

(#37: Mother of a CF carrier)

Some parents underlined how they felt identification of carriers was helpful and did not support further development of screening tests which would not identify carriers:

If you stop telling people that they're carriers, that's got to be going in the wrong direction. Because at least if you're a carrier you know before she has children hopefully they'll talk

about it and he'll go and get tested so they know what the likelihood ...

(#37: Mother of a CF carrier, first child)

... prevention is better than cure people knowing that they've got this status is really important, because there might be less people with the sickle cell disease in the future for people having that knowledge. I mean OK they might completely ignore it and just go ahead and not bother [...] but hopefully the majority will take it on board and think 'I don't want my child to be ill and so therefore I'm going to be careful' you know and that's surely important.

(#35: Mother of an SC carrier, low prevalence area)

Although the majority of parents appeared to understand the 'benign' implications of their baby's carrier status, a minority of parents (four families, two of SC carriers, two of CF carriers) remained unduly concerned about their child's health and well-being after receiving results. They expressed negative or ambivalent reactions to knowledge of their child's carrier result such as guilt or had prominent concerns about the child's health. For example:

Interpreter: She said that after, she feels, after [explanation of results], she feels better, but she's still worried [researcher]. Still worried, even today?

Interpreter: Yes, I'm a little bit concerned.
(#11: Mother of SC carrier)

I don't know if the child has sickle cell (carrier) what they will do? Will he have to take medication? I don't know ... That's what I would like to know, will he have to take medication? What? Why? How will I look after the child? What precautions must I take?

(#14: Mother of SC carrier)

So I still worry and I just think 'She's still little, anything she gets now could bring something else out' you know you've still got it in your head even though it's been cleared up for you you still worry a little bit that how can something genetically just be as black and white as that?

(#40: Mother CF carrier)

You don't like knowing it really do you, but yes it's more helpful to know this so that I can tell her so she grows up with the knowledge of

that ... I just think oh you know if I could take it away I would do, but I can't and it's not going to affect her hopefully just in the fact that when she has children. I am glad I do know, but it's not something, I do still kind of think oh I really hope because I know that being a carrier on the very odd occasion it could grow and get worse but it doesn't generally ...

(#62: Mother of a CF carrier)

Effect of process of communication

For some parents, experience of considerable distress or untoward anxiety among parents (in 12 of 27 CF carrier families, 2 of 24 SC carrier families) most commonly reflected *how* information had been communicated, particularly in relation to communication at the time of repeat blood spot testing in CF screening and thus while parents were awaiting carrier results. Poor communication that failed to anticipate or address concerns adequately appeared to have a major impact at this time, including examples of parents of carriers who became concerned their child was chronically ill or perceived their child as fragile and so limited their interaction with others. During this period, some parents felt depressed, were unable to sleep or concentrate at work, or described a negative impact on personal relationships.

... to some extent these things are often not so much about what you tell me but how you tell me.

(#55: Mother of an SC carrier)

Mother: ... I really wanted to get across was just how really bad the process was for us, but then the relief of eventually getting the results and the relief of knowing that it wasn't cystic fibrosis and the problems of looking to know that we're a carrier and that our baby's going to be absolutely fine really. It was more the process of the actual results you know I think I probably had the hardest time dealing with it because it seemed to be never-ending.

Father: It's the length of time, the lack of communication, lack of knowledge.

(#50: Parents of a CF carrier on the process surrounding second heel prick test and awaiting results)

... you think your daughter's seriously ill and could die and will need physiotherapy all right through her life; will never be able to integrate properly at school and you're thinking 'Well, what's going to happen career-wise?' because

you plan that she'll go to full-time nursery and actually she won't be able to do that, so maybe we'll have to give up work, and you start think financially what will happen? We can't afford for one of us to give up work, so your mind just goes on, and on, and on.

(#4: Father of a CF carrier)

However, further explanation and communication of results in discussion with a well-informed professional appeared to have allayed these concerns in most parents. For example:

Yeah, I mean the guilt was there definitely there's no doubt about it... I think I tried to push it away as much as I possibly could and probably it was there all that time until I actually went to the [genetics centre] and that doctor probably explained it a lot more clearly and to me it sort of dampened it down and from then on when I walked out the door I could feel myself much more relieved by the whole sort of thing.

(#40: Parent of CF carrier)

Among a third of the sample (parents of 17 newborn carriers) who participated in later respondent validation, the parents of five newborn carriers who had experienced considerable distress earlier in the process felt they had since come to terms with the information, and any continuing anxiety was now rare. One reported occasional concerns, for example when their child, a carrier of CF, became unwell with a cold.

Considering further 'cascade' testing within the family

For many parents, knowing their child's carrier status led them to question, and consider establishing, which parent was a carrier; and in particular to consider the carrier status of their other children. In relation to parents' own carrier status, the issue of non-paternity was tangentially raised in three cases; in two cases, parents' carrier status was possibly seen to offer reassurance of paternity, and in one case an oblique reference was made to the child's inheritance of a gene 'skipping a generation'. Some parents had begun to worry if their children were approaching reproductive age, or were from previous relationships, and how they might broach this with their children (see below). While some parents felt unable to 'move on' until testing had occurred for themselves or been offered to other relevant family members, others varied in their desire to do so, and how it may affect

their future decisions. Some parents, however, had experienced difficulties in accessing cascade testing.

... because she is a carrier that means either one of us or both of us carry that mutant gene for cystic fibrosis and that we could if we wanted to opt for further tests. I am of the opinion of I don't want to [know] whereas you are more inclined that you do want to know.

(#19: Parent of a CF carrier)

My other concern was before my three-and-a-half year old was born they weren't specifically tested for this so I wanted to know how I got him tested and she (health visitor) had no idea.

(#13: Mother of an SC carrier, low prevalence area, child subsequently tested)

It's just lingering because I have got two children from my previous marriage and if I am the carrier then it would be nice to inform them and tell them you know what would they like to do about it?

(#5: Father of a CF carrier)

'Oh she's a CF carrier' and I thought is this going to come up every time! That's the other thing that quite bugs me. And I said 'Speaking of which how is it that we can get tested to find out which one of us is the carrier?'

General practitioner: Oh I haven't a clue! Sorry I'm not the person to ask.

(#12: Mother of a CF carrier)

Other families related their concern that despite their newborn being identified as a carrier, they were unable to access cascade testing for their other children until they were older (and had reached the age of consent themselves) with no flexibility in the system:

... I wanted to get [name of older child] tested but because of her age they won't let me have her tested. The argument is she has to wait until she is 16 and classed as an adult or whatever it was... so that she can make the decision herself. I personally as her mum feel I didn't want that. I can understand... maybe in certain cases where parents don't understand or would give the wrong information to children... I could understand why the medical profession would want to keep that but I feel... that we are her parents and we should be able to be responsible in giving her that

information and discussing things with her in an adult way when she is old enough. So you know that is a slight frustration on my part because I just think I would rather know so I can inform her properly.

(#64: Mother of CF carrier, child not tested)

When we told her we said you know, they've said you need to have this test when you're 16 and she just turned round and went 'Why can't I have it now?'

(#12: Mother of a newborn CF carrier talking about talking to her older child, aged 10 years)

Sharing of carrier information with extended family

Most respondents felt a responsibility to share their carrier status information with their extended families, but some struggled with knowing who to tell or how to raise the issue, or were concerned about creating anxiety.

... we found out that my cousin was pregnant, my cousin's girlfriend was pregnant, and [my partner] was saying 'You should tell them about the cystic fibrosis thing' and I was thinking 'I shouldn't tell them about the cystic fibrosis thing because they've got 9 months of worry and then for them to think the baby will have an abnormality when its born' and I don't think that's fair.

(#37: Father of a CF carrier)

Other parents had no concerns about telling others and found their families were supportive. Many respondents' extended families appeared to respond positively to the news, by showing interest, getting tested, and understanding that carrier status has minimal health implications.

So when we found out about her being a carrier it was a Sunday lunch job. Everyone [whole family] round for Sunday lunch, we'll sit round the table, we'll discuss it. And it was really nice you know; you don't have to worry.

(#12: Mother of a CF carrier)

However, respondents also reported negative reactions from their families including relatives avoiding relevant conversations; refusing to believe the information in a context of stigma and ignorance about the conditions; or family members distancing themselves from the issue by blaming

the other side of the family for its inheritance. The latter sometimes occurred between parents, which could exacerbate previously fractious relationships within families.

I think it was down to the fact that people [wider family] were just looking at it as a negative, do you know what I mean. They were looking at it as if something that ... like really ashamed and it was like 'Oh none of us are affected'.

(#37: Parents of a CF carrier)

... the one thing that I think was a bit awful that, not, I don't think we were actually trying to point the finger at each other, but it was like who has got cystic fibrosis then, does it come from your family or does it come from your family. I don't know if it's me or my husband but in the end I suppose it doesn't matter it makes no odds. I don't want to find out you know because I think my husband found out that we could have a swab done, a mouth swab done to find out who has got it. But to be honest with you I don't want to point the finger at him, he doesn't want to point the finger at me ...

(#62: Mother of a CF carrier, second child)

Some families did not wish to pursue cascade testing, creating ambivalence among parents of carriers who did not feel it appropriate to dictate to others, but who also had concerns they should be more proactive to ensure this occurred. The experience of families 'burying their heads in the sand' with lack of family members' engagement in testing caused some distress. For example:

Maybe they are sweeping it a bit under the carpet as well because at 16 and sorry 13 she has a birthday soon at 16, 17 and 13, whatever, they are just not going to be having children yet in their eyes. They see them going to university and having a career so you know they don't see it as potentially something that could be a real issue within the next couple of years or so, so that is another reason for them to dismiss it at this stage.

(#19: Mother of a CF carrier)

It came out that it was his family but you know I have told him but none of his family want to be tested even though his niece is trying to have a baby and ... They don't really, yeah I

begged her but she is not in their family and they don't want to be tested for it you know.
(#22: Parent of CF carrier)

Some parents felt health professionals could better facilitate family communication, either by offering the informant advice on how to discuss the issue or by more directly communicating with other family members. Where this had occurred, this was appreciated:

She [health professional] was trying to be really helpful she e-mailed [husband's name] the letter so that he could get it to his family before and then she posted it out, did she post it out to them or did she ...
(#58: Mother of CF carrier)

Informing children about their carrier status

Although most parents were interviewed when their children were less than a year old, the majority had already thought about informing their child of their result in the future. Most believed that it was essential that their child knew his or her carrier result and were concerned that their child was aware of the reproductive risks of having an affected child. For example:

I think it is almost their right to know really, isn't it? It is their body.
(#13: Parent of SC carrier)

... it might not affect her life but choosing a partner if her partner then had the sickle cell gene trait it would be important for them to know before she got pregnant because you know they can deal with things before it is too late if you like because to be told your baby is carrying something when you're pregnant is a bit too late really. If we are informed about hereditary things beforehand I think it helps you choose really.
(#13: Mother of an SC carrier, low prevalence)

Although parents planned to inform their child, they underlined that it was ultimately their child's decision what he or she did with the information. Nonetheless, some parents felt that rather than facilitating their children's choice this information might constrain their options such as their child's choice of partner and parenting decisions.

We have both decided that he is going to know when he gets older and then that will be up to him how he, what he wants to do. It is up to him if he gets in a serious relationship if he and his partner want to have children then obviously you know she wants to be tested then that is up to them. He will know when he gets older.

(#7: Mother of a CF carrier)

... but he is still not quite happy about it because his son can't like, you know, marry somebody whoever he likes if you think it is not possible to marry somebody he likes if she carries the same group thinking ...
(#1: Father of an SC carrier, via interpreter, high prevalence area)

It might make him have to decide about a relationship with somebody based on the fact that they're both sickle cell carriers. You know, that's a bit of a shame but it's important to know.

(#35: Mother of an SC carrier, low prevalence area)

Parents spoke of informing their child when they were 'older' or when they were old enough to understand the concept of inheritance. Typically, they planned to tell their children at around the ages of 14–16 years or when they started getting boyfriends/girlfriends or became sexually active. Some parents had been informed that their child would go on a local database assembled by some specialist services and would be recalled to discuss the issue with a health professional in the future.

Parents had generally not yet thought through what to tell their children, but some spoke of issues they felt were important to underline. These included that their child was normal and they should not feel stigmatised, and removing any perceptions of blame by understanding that everyone inherits something from their parents.

... if we can turn round and say either one or both of us is a carrier and both of us have been fine and I think that's the positive side of that, he may be a carrier but we know we're fit and healthy and there's no reason that he shouldn't be as well.

(#50: Mother of a CF carrier)

I think she needs to know that she has got a trait but I always think she needs to know that it's nothing that anyone can catch or it's you know it's not an infection or things like that and but we will talk to her about it and I think it is good for her in a sense that I have got it as well and so it's not just her but I think she definitely needs to know.

(#13: Mother of SC carrier, low prevalence area)

Respondents were equally split as to whether they wanted to inform their children themselves, or whether they wanted support from a health professional. Some felt that this message would be more likely to be believed coming from a health professional. They typically anticipated initially informing their child with the aid of available written information with a health professional later becoming involved to clarify information, answer questions and discuss choices.

I think I'm happy to explain it to him at a young age, but I would be quite happy for him to speak to somebody when he reaches that sort of age where he'd be thinking about it because there might be questions that he wants to ask that he wouldn't want to ask me as a parent or his father as a parent you know that's the other thing. Once they become a teenager they become a bit sort of... they don't think you know anything so... [Laughs].

(#35: Mother of an SC carrier, low prevalence area)

I think I would rather do it myself but it would be nice to have the option of if they wanted more information and they wanted questions answering that I couldn't answer because I only know basic things there would be somewhere or somebody that they could call to find out themselves. You know I think that would be really, really helpful because although I can give her the basics you know and what it means to her and what it means to her children and stuff. If she wants any in-depth information I can't give her that because I don't know it.

(#51: Mother of a CF carrier)

I think it would make it too scary anyway I don't really see it as a big thing because lots of the population are probably carriers and don't realise it so I think getting a health professional involved would seem like it is something really scary.

(#58: Parent of a CF carrier)

Some parents believed their child would not be unduly worried by their carrier information, while others were concerned that informing their child might 'upset her confidence in herself' (#34: Parent of SC carrier, first child) and about how their child would adapt to this information (#21: Parent of SC carrier). Parents sought support and guidance about negotiating this with their children, with or without health professional support in the future.

Chapter 6

Discussion

Summary of main findings

This work provides qualitative evidence on the communication of newborn carrier status information to parents following the expansion of newborn screening for SC disorders and CF in England. Using the experiences and perspectives of parents and health professionals, it adds to limited evidence in the field, in particular experience of newborn SC carrier identification,⁵⁷ and to experience of CF carrier identification outside the USA, with the differing CF screening protocol used in England. The study suggests information, communication and support for parents could be enhanced. The research highlights:

- Differing approaches to communicating newborn carrier information in practice within and between regions, and within and between SC and CF carrier contexts.
- The need for specific information for parents at each successive stage of the screening and communication pathway: before and at the time of screening, and when receiving and following results.
- The importance of deploying health professionals who are sufficiently well informed to communicate with parents at these stages.
- In-person communication of results works well for parents of CF carriers, but provision of information is crucially lacking at the stage of repeat blood spot testing.
- Opportunity for in-person communication of results is valued by parents of SC carriers. Although this may not be needed or feasible for all parents, it appears particularly necessary for those without prior knowledge of carrier status or for whom English is not their first language.
- Need for standardised carrier result information for parents in multilingual translated form.
- Rather than learning of their newborn's carrier status per se, some parents' anxiety, distress or misunderstanding appears influenced by how information and communication is offered to them during the screening process, and if they

have less prior awareness of carrier status or the possibility of a carrier result.

- Parents feel positive about gaining this genetic information and its potential utility.
- Most parents understood the benign implications of carrier status and that it may impact on future reproductive decisions.
- Parents need greater support after communication of results in relation to cascade testing and communication within their families.
- Only a minority of parents appeared to have continued concerns about their child.

Thus, these findings also contribute to debate on the potential benefits and harms of newborn carrier identification for families. Respondents wanted to be informed about carrier status in their child and expected this knowledge to be helpful. Anxiety and distress among some parents appeared mostly transient, but was particularly common in relation to the second stage of CF screening (repeat heel prick test) and while awaiting the results of this. Once parents learned their child was a carrier of and was not affected by CF, such distress appeared to subside. For some families where concerns about residual risk surfaced because of respiratory symptoms, sweat testing removed uncertainty. In addition to heightened awareness of SC carrier identification among some parents because of antenatal screening, further testing to exclude the condition is not required when SC carrier status is identified by newborn screening, and any distress appeared much less prominent for parents of SC carriers providing results were understood. Although, arguably, unlikely to surface within this interview-based study, no evidence emerged about harm resulting from identification of non-paternity.

Strengths and limitations

The findings must be interpreted with regard to the study context of evolving experience of implementation of universal newborn screening in the NHS in England, and the range of participating parent and health professionals

within the sample. A range of methods were used in study phases, including purposeful selection, data generation to saturation and respondent validation to enhance rigour, and the relevance and validity of results. The samples in the main part of the study are described in more detail than in earlier work^{59,79} including, for example, information on parents' own carrier status, individuals' experience of whether their newborn's results were contained within written communication, which service providers were involved in communication of information at each stage and how, and local contexts of low or high SC prevalence, in addition to demographic characteristics. This may further aid assessment of the transferability and relevance of the findings beyond the immediate study context.

In addition, study team members from several different disciplines contributed to developing analysis of the data. We have attempted to lay emphasis upon participants' experiences; however, the potential influence of our own backgrounds, including experience as community-based health professionals in practice, on interpretation and the presentation of this research is recognised.

Within the practical constraints of study recruitment and duration, the research has included experience of the range of approaches to, and professionals involved in, communicating newborn carrier information to parents that was known to be in use across the nine health regions of England. The study samples of parents of 24 newborn SC and 27 newborn CF carriers are substantial in this regard, and when compared with previous qualitative interview-based work with parents of SC carriers,⁹⁸ CF carriers^{59,60,79,93} or both types of carrier.⁹⁹ The CF sample was especially hard won (mostly in 2008) and forms a significant proportion of the very small volume of newborn CF carriers identified annually in England. The lack of fathers' perspectives in newborn screening research has caused concern,⁵⁵ but the current study included fathers of newborn carriers wherever possible, with them ultimately forming a quarter of the sample.

While active inclusion of those willing to articulate their experiences is key to qualitative enquiry, we recognise that the experiences and views of study participants may not be typical of all those experiencing carrier identification following

newborn screening. Some respondents may have been self-selecting, and included parents and professionals with particular experiences of communication. Our sample of parents comprised those who were relatively well educated, a feature similar to other studies concerning CF screening in particular.^{58,82} This may however serve to reinforce the findings, suggesting a need to improve the quality of information, communication and support to parents, which might possibly be required even more in less educated families.

The findings are based on the generation and analysis of interview data that have captured the views, experiences and feelings of participants reflecting on events. These include, for example, what parents may have heard and felt when information was communicated by professionals. However further data from contemporaneous recording, observation and analysis of such interactions would be valuable in capturing what and how this actually occurred. This could give greater insights into how communication processes may shape parents' experience and understanding of information.

The study commenced in the second half of 2006 with most data generated during 2007 and 2008, after extending the originally commissioned study period to enable capture of less common and recently identified CF carrier experience. Available in some areas of the country for many years, the implementation of universal newborn screening across England for SC and CF started in 2003 and 2006 respectively, completing by the end of 2006 and 2007. Study data thus reflect the early years of both national screening programmes, particularly for CF, while effective communication was in development and the use of protocols in practice might still have been evolving in some localities. Equally, community awareness of newborn screening for these conditions, and thus potential preparedness for possible results, might also have been generally low, as noted by some study participants. This may be expected to change as programmes become more established. While these evolving contexts should be acknowledged, and similar work may be helpful in the future, the study offers important messages that may inform more effective practice now and further research concerning communication of newborn carrier results.

Comparison with existing evidence: what does this study add?

The study adds to limited previous evidence on parents' experience of communication of newborn carrier results, and a paucity of evidence to inform acceptable and effective methods of this.^{6,8} The findings are consistent with, reinforce or extend other available research. They support other research suggesting parents perceive disclosure of newborn CF carrier results^{15,58-60} or newborn SC carrier results⁹⁸ as valuable in terms of knowing their child's result and in considering establishing carrier status of themselves or other family members, and they anticipate informing their children. Moreover, the findings support that identification of CF or SC newborn carrier status per se is not generally problematic for parents once this is understood; however, the processes by which this is communicated have the potential to cause distress or anxiety, and misunderstanding.^{35,55,59} The study echoes previous work,⁵⁹ suggesting a double message received by parents, noting difficulties and contradictions parents may experience in testing their other children before the age of consent. The study further highlights parents' attitudes towards, and need for greater support in, negotiating the later communication of carrier results within their families,^{15,58,63} to their existing children and newborns in later life,⁶ and in considering and accessing cascade testing.

Communication of newborn sickle cell carrier results

The study contributes evidence on the experience of parents of SC carriers that has been particularly underexplored.⁵⁷ While some parents were content with written communication of results alone, both parent and health professional perspectives underline the importance of in-person rather than indirect communication of results (by letter or telephone) for those parents of newborn SC carriers whose first language is not English, and where there is less prior awareness of carrier screening.⁹⁸ These findings chime with work suggesting that without adequate counselling SC carrier results can lead to distress;⁸⁷ and that, following video information, the opportunity for parents to ask questions of a professional, such as a

genetic counsellor, can improve their knowledge of the reproductive implications of SC carrier status.⁹⁰

Parents in this study emphasised their need for information at different points, and earlier work suggests this can enhance communication. Use of pre-screening (prenatal) educational videos may improve parents' retention of information about SC screening and carrier status.⁶⁹ Similarly, after they have received SC carrier results, parents have reported educational videos as helpful in providing additional information to telephone counselling, and in decreasing their anxiety.⁴¹ Such interventions before screening and after receiving results may be particularly important given research results suggesting that uptake of information and counselling following SC newborn screening results can be low.^{67,85,90,113}

Communication of newborn cystic fibrosis screening results

The study has clearly exposed that, from both parent and professional perspectives, current processes for communicating the need for a second heel prick sample for the second IRT level, and its implications, are ineffective and a major cause of anxiety to parents who are left inadequately informed while awaiting the results. Correspondingly, parents valued the expeditious delivery of results following this second test. This echoes similar concerns in earlier work in the UK,¹³ and in the USA in relation to parents awaiting sweat test results⁹⁶ where there has been concern about a lack of guidance for providing effective support for parents during this stressful waiting period.^{58,114}

The study also reinforces findings, largely from US settings, that parents can be distressed by being informed of carrier results by telephone,⁶⁰ and prefer face-to-face communication of results from an experienced professional, understand the information better this way, and are reassured by provision of additional information resources.^{15,60,89} While, in US settings, preference for in-person communication has often related to the results of sweat testing to confirm or refute a diagnosis of CF, this is arguably analogous to the current English setting of being offered results following a repeat heel prick test for second IRT screen: the primary concern for parents – whether their child is affected with CF – is the same.

Health professionals involved in communicating information

The potential advantages of using a health professional more familiar to the family, rather than an unfamiliar ‘specialist’ professional who may cause more alarm to parents or over-medicalise the nature of carrier results, have been debated.¹³ In the current study, parents had differing experiences of which health professionals were involved – mostly those with specialist screening, or genetic or condition-specific expertise but also those with more generalist community-based backgrounds such as health visitors, particularly with SC carrier results. Our respondents had no particular preference for the type of health professional communicating results to them as long as they were well informed (see Guidance for health professionals). This view is consistent with previous work, for example a retrospective survey suggesting no difference in parents’ knowledge of CF carrier status when informed by differing professionals (although the inclusion of genetic counselling influenced parents’ understanding),⁵⁸ and other work finding no evidence that parents wanted their counsellors to have a particular background.³⁷

Preparedness for results of newborn screening

Parents in the current study were often poorly prepared for the possibility of a carrier result following newborn screening, confirming earlier work,^{98,115} and underlined their need for adequate and more timely information. This has been a consistent concern in the literature,^{61,75,116–118} with support for pre-screening information, for example in later pregnancy⁹³ and the newborn period, to forewarn parents about the possible range of screening results and the possibility of further communication about them, and the need for repeat samples.⁹⁹ Some parents’ confusion and distress during the current study begs the question why this has occurred despite the availability of such information. This study suggests that pre-screening information for both SC and CF could be significantly enhanced in specific ways (see Considering information available to support screening).

Content of communication

Respondents made some reference to the importance of what was communicated, emphasising in particular how anxiety was provoked by lack of clarity in written and verbal communication to them about whether their child was a carrier of SC (or had the possibility of being a CF carrier) or was affected with the condition. Moreover, parents in this study underlined how receiving a first communication highlighting that their child was healthy and not ill before any further communication was made could immediately assuage untoward concerns. This supports other hypothetical work in which analysis of the content of the communication of newborn CF and SC carrier results by paediatricians in simulated consultations with parents has suggested this might be improved by a focus on early placement of reassuring key content (‘it is important for you to know that your baby is healthy now and should continue to be healthy’).^{40,106} Some parents of SC carriers in the current study had also appreciated the ‘heterozygote advantage’ of carrier status, and this positive information could feature more routinely in communication of results, albeit still emphasising the need for appropriate malaria prophylaxis.

Implications for health care Communication with individuals along a pathway

What can be learned from current practice and experience about the effectiveness of methods for communicating carrier status information? Communication of screening information and carrier results reported by parent and professional respondents was not consistently in line with national guidance. Health professionals – both those co-ordinating screening and those communicating results – were concerned about regional variations in how information was communicated to parents, and sought greater consistency and guidance in the use of protocols to ensure equitable services.

Current variable experience of communication found in this study suggests its effectiveness may be improved in two broad ways. Firstly, by regarding effective communication of information and carrier results as something to be achieved along a screening pathway rather than as an exchange that

begins and ends with a single event. Secondly, by making information provision and communication by professionals more parent-centred and sensitive to individual patient contexts. Inevitably, parents will differ in how informed or prepared they may be, and thus in the extent to which any distress is avoidable or not. Professionals should be aware of this and tailor their communication accordingly. This should include anticipating or exploring needs, for example likely low awareness of what

being a carrier means or language needs, and exploiting the knowledge of providers involved across primary, secondary and specialist services.

General recommendations for further development of communication protocols are suggested in *Table 8* (specific suggestions can be found below in Considering information available to support screening and Guidance for health professionals).

TABLE 8 General recommendations for communication across screening pathway

Across whole pathway

- Define and standardise information to be provided at each stage
- Ensure provision of accessible information at each stage
- Ensure professionals supported and competent for their part in communication with parents
- Share communication between specialist and continuing primary care provider

Before screening

- Raise awareness among parents of the rationale and process for screening
- Provide pre-screening information

At screening test

- Use clear information at the time of heel prick testing
- Use clear information at second IRT test for CF, and specify who will communicate its purpose (clear information at this point may reduce untoward anxiety later)

Prior to test results and communication of results

- Proactively inform parents of 'negative' results (do not suggest 'if you don't hear anything then everything is OK')
- Consider how to best make contact with parents and if both parents are available
- Explore whether appropriate pre-screening information has been provided
- Explore antenatal or earlier screening experience of carrier testing or relevant family history (but do not assume understanding of carrier status)
- Identify if one or more parent is a healthy carrier, to reinforce baby will be healthy
- Provide key information for carriers, starting with 'your baby is healthy'
- Signpost to other relevant and reliable information

After test results

- Ensure continued signposting to relevant and reliable information
- Provide guidance and support on cascade testing of parents

Follow-up care

- Provide guidance and support on communication with extended family
- Explore role of primary care for continuing support, information and facilitating testing
- Provide support to parents to communicate results to their children
- Consider proactive follow-up of children approaching reproductive age

Parents' need for timely and appropriate information

Why was parents' need for timely and appropriate information not met consistently or adequately across the screening communication pathway? Respondents' experiences of communication in practice exposed significant areas of concern, and point to potential ways of enhancing the information and protocols used to improve their acceptability and effectiveness. The following sections focus on current information offered to support parents in England and national guidance for professionals involved in screening. These are considered below in relation to this research.

Considering information available to support screening

Written information for parents to support NHS antenatal and newborn screening programmes

in England has evolved to combine previously available programme-specific information leaflets as part of larger antenatal and newborn screening booklets. Before considering written information in relation to study findings, this history is summarised below^{45-50,119} in *Box 2*.

Pre-screening information – preparing parents

Parents, particularly those with less positive experience in the study, said that they wanted to receive screening information earlier, prior to newborn screening. This may suggest that, although most parents may report receiving the newborn blood spot screening leaflet within the first 11 days after the birth of their child,¹²⁰ this information or other information provided in later pregnancy such as *Screening tests for your baby*, may not 'register' with or be read by parents, particularly in the typically busy neonatal period. A further possibility is that this information simply

BOX 2 Information available to parents to support newborn screening in England

Available from 2005, updated 2006

Screening for sickle cell and thalassaemia in early pregnancy

Antenatal 'pre-screening' leaflet on parental carrier testing; also contains brief information on newborn screening for SC (available in multiple translations)⁴⁵

Available from 2006

Newborn blood spot screening for your baby

'Pre-screening' information on screening for phenylketonuria, congenital hypothyroidism, CF and SC (available in multiple translations)⁴⁷

Available from 2007 (February)

Results of newborn blood spot screening: carrier of CF gene

Leaflet (available in English)⁴⁸

Available from 2007 (September)

Results of newborn blood spot screening: carrier of SC gene (available in English)⁴⁹

Results of newborn blood spot screening: carrier of unusual haemoglobin (available in English)⁵⁰

Available from 2007 (January)

Screening tests for you and your baby

This 72-page book provides information on all antenatal and newborn screening tests, combining previous leaflets, and is intended for provision to all women during pregnancy. It incorporates the *Screening for sickle cell and thalassaemia in early pregnancy* leaflet (2006) and *Newborn blood spot screening for your baby* leaflet (2006)⁴⁶

Screening tests for your baby

This 32-page booklet intended for provision during the last trimester of pregnancy and the postnatal period provides information on all newborn screening, including hearing screening. It incorporates the *Newborn blood spot screening for your baby* leaflet (2006)¹¹⁹

did not 'hit home' for other reasons, which may include how the possibility of a carrier result is considered (see below).

Some parents had felt overloaded by screening information antenatally, or found information failed to meet their needs. Many parents had not felt prepared for a carrier result. This may, at least in part, relate to a surfeit of screening information itself: *Screening tests for you and your baby in pregnancy* is 72 pages long, and *Screening tests for your baby in later pregnancy/postnatal period* stands at 32 pages. In addition however, as some parent respondents noted, only the relatively rare disease prevalence of SC and CF is mentioned within information at this stage. In contrast, the much commoner community prevalence of carrier status is not referred to in any pre-screening information for parents. This only surfaces later in information designed for parents once they are informed their child is a carrier.^{48–50}

The SC carrier result leaflets^{49,50} note that there are 'at least 240,000 healthy SC carriers in England', while the CF carrier leaflet⁴⁸ notes that 'approximately 3 million healthy people in the UK are carriers of the CF gene'. As identification of carrier status, in particular SC carrier status, is the most frequent outcome of newborn screening apart from a normal result, pre-screening information may better prepare parents for this possibility by including carrier prevalence and examples of expected scenarios following screening that include the reporting of carrier results. Arguably, other than the process and conditions screened for, if such information is to better prepare parents for anything it might be an SC carrier result. Moreover, facilitating and marketing the internet availability of such information may counter problems of losing leaflets in busy households with young children, and facilitate access when it is most likely to be sought. Further issues for pre-screening information specific to CF screening are discussed below.

Information specific to CF screening

The study has highlighted how lack of information and variation in communication at the time of undertaking a second blood spot test was a major source of stress and anxiety for parents. Both parents and health professionals identified the need for specific written information at this point as a priority. As parents commonly turned to the internet at this stage, such information could usefully be made accessible here.

Parents' experiences of confusion within the screening journey at this point and prior to receiving a CF carrier result suggest scope to enhance pre-screening information. The specific addition of common carrier prevalence in the community may help (see above). Further, within all sets of current information (*Screening tests for you and your baby*,⁴⁶ *Screening tests for your baby*¹¹⁹ or *Newborn blood spot tests for your baby*⁴⁷) it may be possible to achieve greater clarity about what to expect in practice; for example:

- Cystic fibrosis: 'Screening may identify some babies likely to be genetic carriers of CF. These babies may need further testing to find out if they are a healthy carrier, or have CF' rather than indicating this will involve a second heel prick sample.
- Repeat blood samples: (may be needed) 'because there was not enough blood collected, the result was unclear, your baby was born early or had a blood transfusion' rather than indicating this is also a routine procedure for babies with raised IRT levels on the CF screen, who may be identified as healthy carriers of CF.
- How results will be reported: 'If a baby is thought to have cystic fibrosis, parents will usually be contacted before the baby is 4 weeks old' rather than indicating that a second heel prick sample may be involved which may indicate children are healthy carriers of CF.
- Carriers: 'Some babies are found to be carriers. Their parents will be usually be told by the time the child is 6–8 weeks old' rather than indicating parents may be contacted earlier than this for a second heel prick sample to complete screening which may indicate that children are healthy carriers of CF.

Information provided on carrier results

Both programme specific carrier results leaflets^{48–50} were well received by most parents as being clear and easy to understand, highlighting the common prevalence of carrier status and that their child was healthy. Parents found the diagram within SC information illustrating future one in four reproductive risk to two carrier parents to be helpful. This could be considered for inclusion within the CF carrier information, particularly given parents' reported use of such information for future reference or to explain carrier status to their wider families.

In relation to communication in the wider family, there appears to be some disparity between

information for SC and CF carriers which may be addressed. The former highlights the implications for other family members,^{49,50} and encourages them to seek testing with some guidance on how to do so. The latter, for parents of CF carriers, informs of possible reproductive risks but without providing further information.⁴⁸ This lack of guidance was highlighted by parents in this study, some of whom experienced difficulty accessing subsequent carrier testing for themselves.

For those whose first language was not English, the lack of routinely available carrier result information in translated forms was a barrier to access. This was a major concern echoed by health professionals, particularly for SC carriers given greater prevalence among minority ethnic groups. The need for translated materials for non-English speaking parents was emphasised in a recent review of UKNSPC resources.¹²⁰ Although pre-screening information resources are available for internet download in different languages, there remain none available concerning carrier results to support parents' understanding and use for reference with their families. This forms an urgent priority for services that may begin to address this with cost-effective internet available resources, given increasing public access to the internet. The development of multilingual DVD formats for carrier result information means that these may also be considered for use and left with parents at the time of communicating results. Findings also suggested a possible need for greater professional awareness of nationally produced newborn SC carrier result information.

Guidance for health professionals

Study findings are considered below in relation to relevant national guidance for health professionals from four overlapping sources: the *UK Newborn Screening Programme Centre Health Professional Handbook*,⁴⁴ based on national policies and standards for newborn screening, and intended to support health professionals, including midwives and health visitors, in implementing screening; the *National standard protocol for newborn screening for cystic fibrosis*;¹²¹ and *Standards for the linked antenatal and newborn screening programme for sickle cell and thalassaemia*.⁴⁵ The updated *Guidelines for newborn blood spot sampling* was also produced in 2008 by the UKNSPC¹²² to replace these guidelines within the 2005 handbook⁴⁴.

Cystic fibrosis screening – if a repeat sample is requested

Current guidance indicates health professionals should make sure they receive the reason for this request from their screening laboratory and that this should be conveyed to the parent.⁴⁴ It is suggested a midwife does this, if possible with the family's health visitor to aid continuity of support.¹²¹ More recent guidelines add that the midwife should indicate when parents will then receive the result.¹²²

This was the most problematic stage of the communication pathway identified by parents of CF carriers and also recognised as such by health professional respondents. Parents found midwives could appear uninformed or unsure, and offer unclear or inaccurate information about the reasons for a repeat test in this context – such as suggesting the first sample was insufficient. As some parent and professional respondents recognised, this may be a challenge for most busy midwives encountering an uncommon second test request for CF screening. While raising health professional awareness of national guidance may help, the design and provision of a new specific information resource for parents at this stage may prove the most useful. This could include key content addressing the type of parents' concerns identified, such as the likely outcomes of a second test, and when and how they will receive the results. This could be accompanied by the production of a recommended script midwives could use for talking to parents. The provision of, and signposting to, this supporting information on the web and a telephone contact for queries could also be considered.

No parents in the study sample were visited jointly, as suggested in guidance, by a midwife and health visitor. This may be difficult to achieve in practice. Developing a locality-based 'newborn screening practitioner' role to improve continuity of support and information provision for parents and families as part of other dedicated roles across newborn screening programmes might offer promise as an alternative approach (see below).

Giving results – if a baby is identified as a carrier of cystic fibrosis or sickle cell disorder

Current guidance advises that parents should be told CF or SC results as quickly as possible by a well-informed professional, preferably in person or by telephone followed by a home

visit or an appointment, and be provided with written information about their baby's results.⁴⁴ In the case of CF carrier results, it is suggested a 'designated health visitor or alternative trained for the purpose' should occupy this role and visit the family,¹²¹ and that the family's health visitor should also be actively involved where possible.⁴⁴ In the case of SC results, it is suggested parents be offered access to an appropriately trained professional to discuss the result.⁴⁵

Parents in this study had no particular preference for the type of professional who delivered SC or CF results to them, but rather emphasised professional competence and adequate preparation to provide appropriate information and deal with their questions. In contrast, screening co-ordinators interviewed early in this study (2006) considered community-based 'familiar' professionals might be the best placed professionals to give carrier results; while some health professional respondents with experience of communicating results were concerned about 'non-specialist' practitioner competence (see below).

Communicating cystic fibrosis screening and carrier results – effectiveness and feasibility of methods

The potential to significantly improve pre-screening information for parents (at antenatal and immediate postnatal stage) to include carrier prevalence, and what to expect in relation to a second test, with the possibility of a CF carrier result as one outcome of screening, have been highlighted above. The current data suggest this may make a considerable difference to parents, and enable them to refer back to this information during the screening process.

In practice, for parents of CF carriers, all but one family in our sample was informed of carrier results by a health professional with some form of specific background in screening, CF or genetics, either in person or by telephone with a follow-up home visit. This included 'screening nurses/practitioners' and 'screening link health visitors'. Unlike earlier in the pathway (repeat sample), most parents were generally satisfied with this process, the expeditious delivery of results, and the written CF carrier result information provided. However, the latter did not meet the needs of all parents and some professionals felt it could be improved, suggesting potential scope for enhancement (see Chapter 1, Written information for parents).

Despite national guidance, a health visitor was present in only three cases in this study. While the reasons for this are unclear, professionals interviewed, although recognising the potential value of a 'familiar' professional's involvement in the process (in common with some parents), could sometimes find coinciding with a health visitor difficult. It should also be recognised that there is increasing variation in roles and use of community health visiting, which may mean that the traditional model of a health visitor designated to and familiar with a young family may not operate in some localities.¹²³ Moreover, professional respondents did not feel it appropriate for health visitors to routinely discuss newborn CF results with parents, given that it would be uncommon for most community-based generalists to encounter this scenario.

In-person communication with a professional with particular experience in screening, genetics or CF worked well for parents in understanding results. For health professional respondents communicating results in practice, this also appeared the most feasible part of a model for conveying CF carrier results as a generally rare and geographically evenly distributed occurrence. Part of this communication involved allaying anxiety and concerns often precipitated by poor communication and information early in the screening pathway, involving community midwives who were generally responsible for second heel prick testing. As, at this stage, the initial screening result indicates a child may have CF, rather than be a carrier, the use of well-informed in-person communication at this point is arguably particularly important and this greater complexity was underlined by professionals. This is a major difference with SC where a carrier result is not in question following screening.

The study suggests a disconnection between screening and community-based services at this stage. Current processes for communicating the need for a second IRT level and its implications to parents are ineffective and a major cause of anxiety and distress to parents left inadequately informed while awaiting results. How parents are contacted requires greater care, and should involve fully briefed professionals. The development and provision of appropriate information resources for use by professionals, and to give to parents, at this point are noted above.

With the expansion of newborn screening and the greater constraints this may place on current

genetic or CF specialist professionals, the further development of a locality-based community professional role with newborn screening expertise may be considered appropriate as a model, according to local service contexts. A 'newborn screening practitioner' may operate across screening programmes and support midwives, health visitors and other primary care professionals. Roles could include communicating with parents when repeat heel prick testing was needed (a point of reference for and communication of carrier results to parents), continuing liaison with primary care, and providing support and advice to families in relation to cascade testing and communication with extended families. Experience of 'screening link health visitors' and 'screening practitioners' occupying some of these roles in relation to CF and SC carrier results (in a low prevalence region) has been promising (Lynne Mathers, Birmingham, 2007, personal communication).

Communicating sickle cell carrier results – effectiveness and feasibility of methods

The potential to significantly improve pre-screening information for parents (at antenatal and immediate postnatal stage) to include carrier prevalence and the relatively common possibility of a SC carrier result as one outcome of screening has been discussed above. The lack of translated forms of current SC carrier result information has also been highlighted as a priority for development and use.

As noted by health professional respondents, particularly in high prevalence areas, the indirect communication of results by letter appeared effective and feasible for parents who were more aware of SC carrier status from antenatal screening, or other experience, and where, from parents' perspectives, the communication contained both an unambiguous opening statement emphasising 'your child is not ill' and the result itself without delay (rather than offering a clinic appointment to give results).

In contrast, communication of carrier results by letter proved ineffective for those parents without prior knowledge of SC carrier status from antenatal or earlier screening, or for whom English was not their first language. These parents needed in-person communication with a professional before they felt fully informed and reassured about results. Current guidance might highlight avoidance of

indirect communication of results by letter or telephone when alternative language needs might be anticipated.

Most parents of SC carriers received results by letter followed by the offer of a home visit or clinic appointment, often with a health professional with a background in haemoglobinopathies or screening, and were satisfied with this. Community-based primary care professionals, mainly health visitors, were involved much more often than in the CF context (in a third of cases) and imparted SC carrier results themselves, in both high and low prevalence areas. This appeared to be effective for parents if the professional was appropriately informed.

Growth in the volume of newborn SC carriers identified following universal newborn screening presents a major challenge for services, particularly in high prevalence, predominantly metropolitan areas, as underlined by health professional respondents. Use of only resource intensive 'specialist' communication of results may not remain feasible in this context. In addition to the type of health professional involved appearing less important to parents' experience than how well informed they are, health professional respondents noted that linked antenatal screening is creating growth in parents' awareness of carrier status and counselling during pregnancy. There thus appears significant potential for the greater use and feasibility of mixed models of communicating newborn carrier results that may be acceptable and effective. These could be less dependent on specialist support by more routinely involving generalist professionals in primary care if they were supported with the appropriate tools, training and support.

Moreover, such approaches may facilitate greater or more proactive involvement of primary care in providing continuing support and guidance to families, for example in relation to cascade testing and future reproductive risk as part of sustaining continuity of primary care. This might be located alongside developing approaches for common recessively inherited disorders in primary care.¹²⁴

In high prevalence areas, for example, possible mixed models for communication of SC carrier results could include the use of a letter containing the results and supporting information (translated as appropriate), with routine follow-up by a family health visitor⁶⁵ or GP for further discussion, and referral on to a specialist professional for further

counselling if necessary or requested. Given current study evidence that prior knowledge may assist communication, and parents may require more timely and appropriate pre-screening information, the use of other pre-screening interventions, such as educational audiovisual information, that have shown promise elsewhere may be considered, particularly in high prevalence areas.⁶⁹

In lower prevalence areas, where levels of awareness and the opportunity for familiarity and practice in communicating results would be much less common, a model involving communication by a professional with more specialist experience may remain more feasible and effective, and the potential development of a newborn screening practitioner role may also be considered (see above).

Research recommendations

Addressing information needs

Further research is needed to develop information for use in the screening pathway where this has been identified as lacking, and to explore the refining of existing information. The design and evaluation of specific information for parents approached for a repeat heel prick test in CF screening (after an initially raised first IRT) is an immediate priority. This may be informed by data generated with parents in the current study. Use of a consensus process with practitioners, parents and screening programme stakeholders in iterative stages could further clarify the critical issues, prioritise and define content, and optimise presentation and accessibility, followed by piloting in practice. Quality criteria for health information and methods for information development in genetics are becoming available to support such work.^{125,126}

The potential value of refining current pre-screening information to prepare parents better for the possibility of carrier identification should be further explored, and its development could use a similar consensus approach. This is arguably of greater concern for SC screening given that SC carrier identification is the most common outcome of newborn screening other than a normal result. Further research should consider if and how information on carrier prevalence and carrier results should be included in pre-screening information, perhaps illustrated by offering example scenarios, and assess its impact. The inclusion of carrier prevalence and more specific

information on the purpose and outcomes of repeat testing in current CF screening might also form the subject of further enquiry. However, given the point at which most concern appears to be generated for the rarer identification of CF carrier status, the targeting of more effective support using specific information and communication at the stage of a second blood spot test for IRT is a greater priority.

Development of translated versions of national programme SC carrier result information (perhaps including that produced by the ApoGI, which was also commonly used by haemoglobinopathy counsellors and other professionals), in line with those languages already available within newborn pre-screening information, should form a further focus. This should include exploration of accessibility and cross-cultural equivalence of meaning with intended user communities, in addition to the feasibility and acceptability of provision beyond leaflet form (or internet availability) in alternative formats such as multilingual DVD. Further research on relative acceptability, effectiveness and cost-effectiveness of different forms of SC carrier result information is particularly lacking and would be valuable as part of wider research on appropriate service models.

The utility and value of pre-screening and carrier results information for parents will be influenced by the extent to which, and how, health professionals use, provide and present such information. Further research to investigate, quantify and understand these processes across the screening pathway would be helpful. Similarly, observational research on communication of carrier results in health encounters may yield valuable information on how parental understanding may be achieved, as distinct from simply receiving standardised and consistent information.

Developing and supporting health professional roles

While development and evaluation of better quality information for parents may be more realisable in the short-term, further R&D of support for health professionals involved in screening to be appropriately well informed and able to communicate relevant information is also needed. This may be aimed at those without specialist genetic or screening backgrounds. Starting points might include assessing the utility of scripts with key points and content for health professionals to use to support their interactions with parents,

for example when undertaking repeat heel prick testing or communicating results. Research that explores how best to develop capacity and competence in primary care and sustain these to support newborn screening would also be valuable, including, for example, assessing the effects of ‘within encounter’ electronic informational support for general practitioners or health visitors concerning carrier results or the provision of advice on cascade testing in families.

Development of service models

As noted above, the current study was commissioned and undertaken relatively early in the implementation of the screening programmes, in particular for CF. Further prospective study or auditing of current practice may be helpful with further establishment of this screening. The wide diversity of current service models for communicating newborn carrier results (in terms of initial contact), information used and health professionals involved means sufficiently well-developed and clearly defined interventions for experimental testing of effectiveness, for example in a controlled trial, are currently lacking. It should also be acknowledged that while a controlled trial could ultimately be feasible in the context of SC, the very limited numbers of newborn CF carriers identified annually would likely preclude this trial design. Nevertheless, further research could be used to assess parental reception to and the effect of using a ‘newborn screening practitioner’ or screening link health visitor, as discussed above, in relation to enhancing experience at the currently problematic stage of repeating the IRT test, and in supporting communication with parents across both SC and CF screening pathways.

Further examination of the use of differing mixed service models, in particular with greater involvement of primary care professionals to communicate newborn SC carrier results, merits particular attention (see Communicating sickle cell carrier results – effectiveness and feasibility of methods, above). This could involve case study or action research designs, before and after comparison of models, or a prospective audit to evaluate impact for parents and feasibility for providers. Such research might ideally inform the potential development and definition of the most promising and feasible service models as complex interventions for prospective testing. Although it may be anticipated that further research could lead to an optimum approach, in reality, one size may not fit all areas and populations. The chief aim of further research may therefore be to define

and establish what core level of service provision, information and practitioner competence consumers should expect in the context of carrier identification following newborn screening.

Other research with parents of newborn carriers

Research with parents is needed to develop appropriately specific outcome measures in this field – such as parental knowledge and parental understanding of information – to robustly assess the effectiveness of information and the communication of carrier status and their implications in the future.

While identification of CF carrier status is rare and identification of SC carrier status is common following newborn screening, the weight of research in this field has occurred in relation to CF. Further research in the context of SC should be prioritised and involve larger studies, assisted by the relatively large numbers of carriers identified, to further examine views on information and communication, in addition to the impact of this within new service models, and the longer term impacts of carrier identification.

The current research did not include parents who declined or did not avail themselves of further information or the opportunity for counselling on newborn carrier results. Low service uptake has been identified as a particular issue among parents of SC carriers in the USA,^{67,85,90,113} and is anecdotally recognised as common in practice in the UK. Research is needed to explore the scale of and reasons for non-uptake, and to identify the potentially neglected service needs of this group. At the same time, there was little evidence from the current data to support a commonly held assumption that awareness or knowledge of SC was greater in high prevalence areas and ‘minority’ communities, in particular those of African origin. Empirical work to establish this would be valuable to inform both practice and community awareness raising interventions.

The current study focused on interaction with the health-care system. While finding some evidence of misplaced beliefs and misconceptions about SC, the study did not explore the wider contexts of community awareness and its potential influence on positive or negative experience of communication of carrier results. Recent research in the USA found highly variable knowledge and major misunderstandings about SC.¹²⁷ This should

be further explored, perhaps using the context of increasing the implementation of community awareness programmes on screening in the UK.

The screening process does not end with post-test counselling and information for parents of carriers or, indeed, affected children. Over the longer term, carrier parents, other children, extended family and the wider community will all need salient information, advice and support. Research on trajectories following newborn carrier results is sparse and there are many unanswered questions. Further research is needed on:

- Parents' attitudes towards, access to and experience of, further carrier testing for themselves or their other children following identification of their newborn's carrier status, what affects their decision-making, and its impact on their later reproductive decisions.

- Assessing any medium or longer term impact on parents' attitudes towards their child or the parent-child relationship.
- The development of information and methods to support cascade testing and communication in families, the acceptability and impact of doing so, and which and how services can best support families, including the potential role of primary care in providing continuity of care.
- How to support parents in telling their children in later life about their carrier results.
- Whether anxiety or other harm is created by any of these issues, whether they endure, and how they may be prevented or reduced.

This research can further inform evidence for continuing service provision and support, and greater understanding of the longer term benefits or harm arising from newborn carrier identification.



Acknowledgements

We are most grateful to all study participants and the wide range of health professionals across England who assisted with recruitment of parents. We thank Hilda Parker for her contribution while at University of Nottingham in leading the preliminary study phase in 2006 and its publication (Chapter 3), and project field work in 2007, including interviewing parents of 19 newborn carriers. We thank members of a study external advisory group for their support and advice throughout (Jim Bonham, Carole McKeown, Annette Pilkington, Lurieteen Miller, Cris Glazebrook, Bernadette Modell); Angela Beighton and Kath Bellfield for transcription of interviews and administrative support; Angela Beighton and Tracey George for assistance with coding data; and several NHS and other stakeholders (Lorna Bennett, Jim Bonham, Jean Chapple, Scott Grosse, Jo Harcombe, Barbara Judge, Annette Pilkington, Jim Price, Kevin Southern, Allison Streetly) for their helpful comments on an earlier

draft summary of this report. We thank anonymous reviewers for their feedback, and particularly thank Sandy Oliver for detailed comments which assisted completion of the full report.

Contribution of authors

Tim Cullinan (research associate) contributed to the literature review, interviewing of participants, data analysis and sections of the report. Joe Kai (clinical professor) was principal investigator and grant-holder, he designed and supervised the research, and completed development and writing of all sections of the report. Nadeem Qureshi (associate clinical professor) was grant co-applicant, and contributed to the literature review and report drafting. Fiona Ulph (research fellow) led the literature review, NHS R&D applications, recruitment, interviewing, and data analysis, and contributed to drafting sections of the report.



References

1. Pollitt RJ, Green A, McCabe CJ, Booth A, Cooper NJ, Leonard JV, *et al.* Neonatal screening for inborn errors of metabolism: cost, yield and outcome. *Health Technol Assess* 1997;**1**(7).
2. Botkin JR, Clayton EW, Fost NC, Burke W, Murray TH, Bially MA, *et al.* Newborn screening technology: proceed with caution. *Paediatrics* 2006;**117**:1793–9.
3. Grosse SD, Boyle CA, Kenneson A, Khoury MJ, Wilfond BS. From public health emergency to public health service: the implications of evolving criteria for newborn screening panels. *Paediatrics* 2006;**117**:923–9.
4. Howell RR. We need expanded newborn screening. *Paediatrics* 2006;**117**:1800–5.
5. Clarke A. The genetic testing of children. *J Med Genet* 1994;**31**:785–97.
6. Laird L, Dezateux C, Anionwu EN. Neonatal screening for sickle cell disorders: What about the carrier infants? *BMJ* 1996;**313**:407–11.
7. Grosse SD. Newborn screening for cystic fibrosis: evaluation of benefits and risks and recommendations and reports section of the CDC publication Morbidity and Mortality weekly report Vol 53, rr-13, October 15 2004. *J Paediatr* 2005;**147**:S1.
8. Oliver S, Dezateux C, Kavanagh J, Lempert T, Stewart R. Disclosing to parents newborn carrier status identified by routine blood spot screening. *Cochrane Database Syst Rev* 2004;**4**:1–12.
9. Farrell PM, Mischler E. Newborn screening for cystic fibrosis: Neonatal screening study group. *Adv Paediatr* 1992;**39**:35–70.
10. Murray J, Cuckle H, Taylor G, Littlewood J, Hewison J. Screening for cystic fibrosis. *Health Technol Assess* 1999;**3**(8).
11. Bailey DBJ, Skinner D, Davis AM, Whitmarsh I, Powell C. Ethical, legal, and social concerns about expanded newborn screening: fragile X syndrome as a prototype for emerging issues. *Paediatrics* 2008;**121**:693–704.
12. Almond B. Genetic profiling of newborns: ethical and social issues. *Nat Rev Genet* 2006;**7**:67–71.
13. Oliver S, Lempert T, Stewart R, Kavanagh J, Dezateux C. *Disclosing to parents newborn carrier status identified by routine blood spot screening*. London: University of London, EPPI Centre Social Science Research Unit Institute of Education; 2004.
14. Tluczek A, Mischler E, Farrell PM. Parents' knowledge of neonatal screening and response to false-positive cystic fibrosis testing. *J Dev Behav Paediatr* 1992;**13**:181–6.
15. Mischler EH, Wilfond BS, Fost N, Laxova A, Reiser C, Sauer C, *et al.* Cystic fibrosis newborn screening: Impact on reproductive behaviour and implications for genetic counseling. *Paediatrics* 1998;**102**:44–52.
16. Downing M, Pollitt R. Newborn bloodspot screening in the UK – past, present and future. *Ann Clin Biochem* 2008;**45**:11–17.
17. Balfour-Lynn I. Newborn screening for cystic fibrosis: evidence for benefit. *Arch Dis Child* 2008;**93**:7–10.
18. Department of Health. *The NHS Plan, July 2000: a plan for investment, a plan for reform*. London: HMSO; 2000.
19. Department of Health. *Report of a working party of the standing medical advisory committee on sickle cell, thalassaemia and other haemoglobinopathies (SMAC report)*. London: HMSO; 1993.
20. Zeuner D, Ades AE, Karnon J, Brown J, Dezateux C, Anionwu EN. Antenatal and neonatal haemoglobinopathy screening in the UK: review and economic analysis. *Health Technol Assess* 1999;**3**(11).
21. Davies SC, Cronin E, Gill M, Greengross P, Hickman M, Normand C. Screening for sickle cell disease and thalassaemia: a systematic review with supplementary research. *Health Technol Assess* 2000;**4**(3).
22. Human Genetics Commission. *Making babies: reproductive decisions and genetic technologies*. London: Human Genetics Commission; 2006.

23. Lin K, Barton M. Screening for haemoglobinopathies in newborns: reaffirmation update for the U.S. Preventative Services Task Force. In: Quality AfHRA, editor. *Evidence synthesis No. 52*. Rockville, MD: Agency for Healthcare Research and Quality; 2007. AHRQ Publication No. 07-05104-EF-1
24. Streetly A, Latinovic R, Hall K, Henthorn J. Implementation of universal newborn bloodspot screening for sickle cell disease and other significant haemoglobinopathies in England: screening results for 2005–2007. *J Clin Pathol* 2009;**62**:26–30.
25. Farrell PM, Kosrock MR, Laxova A, Shen G, Koscile R, Bruns WT, *et al*. Nutritional benefits of neonatal screening for cystic fibrosis. *New Engl J Med* 1997;**337**:963–9.
26. Denayer L, Welkenhuysen M, EversKiebooms G, Cassiman JJ, VandenBerghe H. Risk perception after CF carrier testing and impact of the test result on reproductive decision making. *Am J Med Genet* 1997;**69**:422–8.
27. Fang CY, Dunkel-Schetter C, Tatsugawa ZH, Fox MA, Bass HN, Crandall BF, *et al*. Attitudes toward genetic carrier screening for cystic fibrosis among pregnant women: The role of health beliefs and avoidant coping style. *Womens Health* 1997;**3**:31–51.
28. Lai HC, Cheng Y, Cho H, Kosorok MR, Farrell PM. Relationship between initial disease presentation, lung disease outcomes and survival in patients with cystic fibrosis. *Am J Epidemiol* 2004;**159**:537–46.
29. Merelle ME, Schouten JP, Gerritsen J, Dankert-Roelse JE. Influence of neonatal screening and centralised treatment on long-term clinical outcome and survival of CF patients. *Eur Respir J* 2001;**18**:306–15.
30. Southern KW, Munck A, Pollitt R, Travert G, Zanolla L, Dankert-Roelse J, *et al*. A survey of newborn screening for cystic fibrosis in Europe. *J Cyst Fibros* 2007;**6**:57–65.
31. Friedman Ross L. Newborn screening for cystic fibrosis: A lesson in public health disparities. *J Paediatr* 2008;**153**:308–13.
32. Duff A, Brownlee K. Psychosocial aspects of newborn screening programmes for cystic fibrosis. *Child Health Care* 2008;**37**:21–37.
33. Al-Jader LN, Goodchild MC, Ryley HC, Harper PS. Attitudes of parents of cystic fibrosis children towards neonatal screening and antenatal diagnosis. *Clin Genet* 1990;**38**:460–5.
34. Elliman DAC, Dezateux C, Bedford HE. Newborn and childhood screening programmes: criteria, evidence, and current policy. *Arch Dis Child* 2007;**87**:6–9.
35. Southern KW. Newborn screening for cystic fibrosis: the practical implications. *J Roy Soc Med* 2004;**97**(Suppl. 44):57–9.
36. Dillard JP, Tluczek A. Information flow after a positive newborn screening for cystic fibrosis. *J Paediatr* 2005;**147**:s94–7.
37. Farrell MH, Certain LK, Farrell PM. Genetic counselling and risk communication services of newborn screening programmes. *Arch Paediatr Adolesc Med* 2001;**155**:120–6.
38. Fanos JH. Developmental tasks of childhood and adolescence: Implications for genetic testing. *Am J Med Genet* 1997;**71**:22–8.
39. Farrell MH, Farrell PM. Newborn screening for cystic fibrosis: ensuring more good than harm. *J Paediatr* 2003;**143**:707–12.
40. La Pean A, Farrell MH. Initially misleading communication of carrier results after newborn genetic screening *Paediatrics* 2005;**116**:1499–505.
41. Kladny B, Gettig EA, Krishnamurti L. Systematic follow-up and case management of the abnormal newborn screen can improve acceptance of genetic counseling for sickle cell or other haemoglobinopathy trait. *Genet Med* 2005;**7**:139–42.
42. UK Newborn Screening Programme Centre. *Communication Guidelines: When your baby is suspected of being a carrier of cystic fibrosis*. 2007. URL: www.newbornbloodspot.screening.nhs.uk/cf/consultation.htm. Last accessed November 2008.
43. NHS Sickle Cell and Thalassaemia Screening Programme. *Standards for the linked Antenatal and Newborn Screening Programme*. London: NHS Sickle Cell and Thalassaemia Screening Programme; 2006.
44. UK Newborn Screening Programme Centre. *Newborn blood spot screening in the UK: Health professional Handbook*. London: Institute of Education, University of London; 2005.
45. NHS Sickle Cell & Thalassaemia Screening Programme. *Screening for sickle cell and thalassaemia in early pregnancy*. London: NHS Sickle Cell and Thalassaemia Screening Programme; 2005.
46. UK National Screening Committee. *Screening tests for you and your baby*. Leeds: National Screening Committee; 2008.

47. UK National Screening Committee. *Newborn blood spot screening for your baby*. Leeds: UK National Screening Committee; 2005.
48. UK Newborn Screening Programme Centre. *Results of newborn blood spot screening: carrier of cystic fibrosis gene*. London: UK Newborn Screening Programme Centre; 2007.
49. NHS Sickle Cell & Thalassaemia Screening Programme. *Results of newborn blood-spot screening: carrier of a sickle cell gene – sometimes called trait HbAS*. London: NHS Sickle Cell and Thalassaemia Screening Programme; 2007.
50. NHS Sickle Cell & Thalassaemia Screening Programme. *Results of newborn blood-spot screening: carrier of a gene for an unusual haemoglobin – sometimes called trait Hb AC, Hb AD, Hb AOArab, Hb AE, Hb A Lepore*. London: NHS Sickle Cell and Thalassaemia Screening Programme; 2007.
51. NHS Sickle Cell & Thalassaemia Screening Programme. *Training: Pegasus – Professional Education for Genetic Assessment and Screening*. London: NHS Sickle Cell and Thalassaemia Screening Programme; 2008.
52. UK Newborn Screening Programme Centre. *Training for the implementation of newborn screening for cystic fibrosis*. London: UK Newborn Screening Programme Centre; 2005.
53. UK Newborn Screening Programme Centre. *Information for implementation of CF Screening – training materials*. London: UK Newborn Screening Programme Centre; 2007.
54. Gaff CL, Aitken MA, Flouris A, Metcalfe SA. A model for the development of genetics education programs for health professionals. *Genet Med* 2007;**9**:451–7.
55. Green JM, Hewison J, Bekker HL, Bryant LD, Cuckle HS. Psychosocial aspects of genetic screening of pregnant women and newborns: a systematic review. *Health Technol Assess* 2004;**8**(33).
56. Grosse SD, Boyle CA, Botkin JR, Comeau AM, Kharrazi M, Rosenfeld M, *et al*. Newborn screening for cystic fibrosis: evaluation of benefits and risks and recommendations for state newborn screening programs. *MMWR Recomm Rep* 2004;**53**:1–36.
57. Hayeems RZ, Bytautas JP, Miller FA. A systematic review of the effects of disclosing carrier results generated through newborn screening. *J Genet Couns* 2008;**17**:538–49.
58. Ciske DJ, Haavisto A, Laxova A, Rock LZM, Farrell PM. Genetic counseling and neonatal screening for cystic fibrosis: An assessment of the communication process. *Paediatrics* 2001;**107**:699–705.
59. Parsons EP, Clarke AJ, Bradley DM. Implications of carrier identification in newborn screening for cystic fibrosis. *Arch Dis Child Fetal Neonatal Ed* 2003;**88**:467–71.
60. Tluczek A, Kosciak RL, Farrell PM, Rock MJ. Psychosocial risk associated with newborn screening for cystic fibrosis: parents' experience while awaiting the sweat-test appointment. *Paediatrics* 2005;**115**:1692–703.
61. Kemper AR, Fant KE, Clark SJ. Informing parents about newborn screening. *Public Health Nurs* 2005;**22**:332–8.
62. Kavanagh PL, Wang C, Therrell BL, Sprinz PG, Bauchner H. Communication of positive newborn screening results for sickle cell disease and sickle cell trait: Variation across states. *Am J Med Genet C Semin Med Genet* 2008;**148**:15–22.
63. Lewis S, Curnow L, Ross M, Massie J. Parental attitudes to the identification of their infants as carriers of cystic fibrosis by newborn screening. *J Paediatr Child Health* 2006;**42**:533–7.
64. Stewart R, Oliver S. *What is known about communication with parents about newborn bloodspot screening?* London: UK Newborn Screening Programme Centre; 2003.
65. Rao JN, Handa SJ, Stableforth PJ, Martin J, Watson H, Augustine G. Infants in Sandwell are screened for haemoglobinopathy gene. *BMJ* 1996;**313**:1403.
66. Anionwu E. Sickle cell disease: screening and counselling in the antenatal and neonatal period. *Midwife Health Visit Community Nurse* 1983;**19**:440–3.
67. Grossman LK, Holtzman NA, Charney E, Schwartz AD. Neonatal screening and genetic counseling for sickle cell trait. *Am J Dis Child* 1985;**139**:241–4.
68. Whitten CF. Sickle-cell programming – an imperiled promise. *New Engl J Med* 1973;**288**:318–9.
69. Yang YM, Andrews S, Peterson R, Shah A, Cepeda M. Prenatal sickle cell screening education effect on the follow-up rates of infants with sickle cell trait. *Patient Educ Couns* 2000;**39**:185–9.
70. Wheeler PG, Smith R, Dorkin H, Parad RB, Comeau AM, Bianchi DW. Genetic counselling after implementation of statewide cystic fibrosis newborn screening: Two years' experience in one medical centre. *Genet Med* 2001;**3**:411–15.

71. Curnow L, Savarirayan R, Massie J. Genetics counselling after carrier detection by newborn screening when one parent carrier deltaF508 and the other R117H. *Arch Dis Child* 2003;**88**:886–8.
72. Moran J, Quirk K, Duff A, Brownlee K, McLaughlin S. Newborn screening for CF in a regional paediatric centre: psychosocial effects of false-positive results on parents and re-evaluating service provision. *J Cyst Fibros* 2003;**2**:S91–7.
73. Baroni MA, Anderson YE, Mischler E. Cystic fibrosis newborn screening: impact of early screening results on parenting stress. *Pediatr Nurs* 1997;**23**:143–51.
74. Zavataro L, Festini F, Di Bilio C, Mergni G, Ravenni N, Taccetti G, *et al.* Emotional impact of a CF neonatal screening program: preliminary results of a prospective study. *J Cyst Fibros* 2005;**4**:114.
75. Sorenson J, Levy HL, Mangione TW, Sepe SJ. Parental response to repeat testing of infants with 'false-positive' results in a newborn screening program. *Pediatrics* 1984;**73**:183–7.
76. Waisbren SE, Albers S, Amato S, Ampola M, Brewster TG, Demmer L, *et al.* Effect of expanded newborn screening for biochemical genetic disorders on child outcomes and parental stress. *JAMA* 2003;**290**:2564–72.
77. Merelle ME, Nagelkerke AF, Lees CM, Dezateux C. Newborn Screening for cystic fibrosis. *Cochrane Database Syst Rev* 2002;**1**.
78. Campbell PW, White TB. Newborn screening for cystic fibrosis: an opportunity to improve care and outcomes. *J Paediatr* 2005;**147**:s2–5.
79. Moran J, Quirk K, Duff A, Brownlee KG. Newborn screening for CF in a regional paediatric centre: The psychosocial effects of false-positive IRT results on parents. *J Cyst Fibros* 2007;**6**:250–4.
80. Pollitt RJ, Dalton A, Evans S, Hughes HN, Curtis D. Neonatal screening for cystic fibrosis in the Trent region (UK): two-stage immunoreactive trypsin screening compared with a three stage protocol with DNA analysis as an intermediate step. *J Med Screen* 1997;**4**:23–8.
81. Hargreaves KM, Stewart RJ, Oliver SR. Informed choice and public health screening for children: The case of blood spot screening. *Health Expect* 2005;**8**:161–71.
82. Tluczek A, Mischler EH, Bowers B, Peterson N, Morris M, Farrell P, *et al.* Psychological impact of false-positive results when screening for cystic fibrosis. *Pediatr Pulmonol Suppl* 1991;**7**:29–37.
83. Gurian E, Kinnamon D, Henry J, SE W. Expanded newborn screening for biochemical disorders: the effect of a false-positive result. *Paediatrics* 2006;**117**:1915–21.
84. Miller S, Stilerman T, Rao S, Abhyankar S, Brown A. Newborn screening for sickle cell disease: When is an infant 'lost to follow-up'? *Am J Dis Child* 1990;**144**:1343–5.
85. Hurst D. Newborn screening for sickle cell disease and other haemoglobinopathies: Northern California's experience. *Paediatrics* 1989;**83**:868–71.
86. Whitten CF, Thomas JF, Nishiura EN. Sickle cell trait counseling – evaluation of counselors and counselees. *Am J Hum Genet* 1981;**33**:802–16.
87. Horn M, Dick M, Frost B, Davis L, Bellingham A, Strand C, *et al.* Neonatal screening for sickle cell diseases in Camberwell: results and recommendations of a two year pilot study. *Br Med J* 1986;**292**:37–74.
88. Comeau AM, Parad RB, Gerstle R, O'Sullivan BP, Dorkin H, Dovey M, *et al.* Communications systems and their models: Massachusetts parent compliance with recommended speciality care after positive cystic fibrosis newborn screening result. *J Paediatr* 2005;**147**:s98–100.
89. Lagoe E, Labella S, Arnold G, Rowley PT. Cystic fibrosis newborn screening: a pilot study to maximise carrier screening. *Genet Test* 2005;**9**:255–60.
90. Rowley PT. Parental receptivity to neonatal sickle trait identification. *Paediatrics* 1989;**83**:891–3.
91. Grover R, Newman S, Wethers D, Anyaneyboa K, Pass K. Newborn screening for haemoglobinopathies: the benefit beyond the target. *Am J Public Health* 1986;**76**:1236–7.
92. Quinlivan JA, Suriadi C. Attitudes of new mothers towards genetics and newborn screening. *J Psychosom Obstet Gynaecol* 2006;**27**:67–72.
93. Davis TC, Humiston SG, Arnold CL, Bocchini JA, Bass PF, Kennen EM, *et al.* Recommendations for effective newborn screening communication: results of focus groups with parents, providers, and experts. *Paediatrics* 2006;**117**:326–40.
94. Grob R. Is my sick child healthy? Is my healthy child sick?: Changing parental experiences of cystic fibrosis in the age of expanded newborn screening. *Soc Sci Med* 2008;**67**:1056–64.
95. Parsons E, King JT, Israel JA, Bradley DM. Mothers' accounts of screening newborn babies in Wales (UK). *Midwifery* 2007;**23**:59–65.

96. Tluczek A, Kosciak RL, Modaff P, Pfeil D, Rock MJ, Farrell PM, *et al.* Newborn screening for cystic fibrosis: Parents' preferences regarding counseling at the time of infants' sweat test. *J Genet Couns* 2006;**15**:277–91.
97. Grob R. Parenting in the genomic age: the 'cursed blessing' of newborn screening. *New Genet Soc* 2006;**25**:159–70.
98. Locock L, Kai J. Parents' experiences of universal screening for haemoglobin disorders: Implications for practice in a new genetics era. *Br J Gen Pract* 2008;**58**:161–8.
99. Lempert T, Oliver S, Stewart R, Dezateux C. *Communication of carrier results following newborn blood spot screening: parents' and health professionals' experiences*. London: Social Science Research Unit, Institute of Education, University of London; 2004.
100. Farrell M, Deuster L, Donovan J, Christopher S. Paediatric residents' use of jargon during counseling about newborn genetic screening results. *Paediatrics* 2008;**122**:243–9.
101. Wilfond B, Gollust SE. Policy issues for expanding newborn screening programs: The cystic fibrosis newborn screening experience in the United States. *J Paediatr* 2005;**147**:668–74.
102. Acharya K, Ackerman PD, Ross LF. Paediatricians' attitudes towards expanding newborn screening. *Paediatrics* 2005;**116**:E476–82.
103. Munck A, Duff A, Southern KW, Castellani C. Survey of the information provided for parents about newborn screening for CF in European programmes. *J Cyst Fibros* 2007;**6**:s65.
104. Hiraki S, Ormond KE, Kim K, Ross LF. Attitudes of genetic counselors towards expanding newborn screening and offering predictive genetic testing to children. *Am J Med Genet Part A* 2006;**140A**:2312–19.
105. McClaren BJ, Delatycki MB, Collins V, Metcalfe SA, Aitken M. 'It is not in my world': An exploration of attitudes and influences associated with cystic fibrosis carrier screening. *Eur J Hum Genet* 2008;**16**:435–44.
106. Farrell MH, La Pean A, Ladouceur L. Content of communication by paediatric residents after newborn genetic screening. *Paediatrics* 2005;**116**:1492–8.
107. Kemper AR, Uren RL, Moseley KL, Clark SJ. Primary care physicians' attitudes regarding follow-up care for children with positive newborn screening results. *Paediatrics* 2006;**118**:1836–41.
108. Wilfond BJ, Parad RB, Fost N. Balancing benefits and risks for cystic fibrosis newborn screening: implications for policy decisions. *J Paediatr* 2005;**147**:s109–13.
109. Tarini BA. The current revolution in newborn screening: new technology, old controversies. *Arch Paediatr Adolesc Med* 2007;**161**:767–72.
110. Gill C. *Review of resources currently available to support Haemoglobinopathy Screening Programmes in England*. NHS Sickle Cell and Thalassaemia Programme; 2004.
111. Parker H, Qureshi N, Ulph F, Kai J. Imparting carrier status results detected by universal newborn screening for sickle cell and cystic fibrosis in England: A qualitative study of current practice and policy. *BMC Health Serv Res* 2007;**7**:203–11.
112. APoGI. Accessible Publishing of Genetic Information. URL: www.chime.ucl.ac.uk/APoGI. Last accessed November 2008.
113. Githens J, Lane PA, McCurdy R, Houston M, McKinna J, Cole D. Newborn screening for haemoglobinopathies in Colorado. The first 10 years. *Am J Dis Child* 1990;**144**:466–70.
114. Comeau AM, Accurso F, White TB, Campbell PW, Hoffman G, Parad RB, *et al.* Guidelines for implementation of Cystic Fibrosis Newborn Screening Programs: Cystic Fibrosis Foundation Workshop Report. *Paediatrics* 2007;**119**:495–518.
115. Statham H, Green J, Snowdon C. Mothers' consent to screening newborn babies for disease. *BMJ* 1993;**306**:858–9.
116. Grosse SD, Boyle CA, Cordero JF. Newborn screening for cystic fibrosis: Recommendations from the Centers for Disease Control and Prevention. *Am Fam Physician* 2005;**71**:1482, 1487.
117. Clayton EW. Talking with parents before newborn screening. *J Paediatr* 2005;**147**:s26–9.
118. Campbell E, Friedman Ross L. Parental attitudes and beliefs regarding the genetic testing of children. *Community Genet* 2005;**8**:94–102.
119. UK National Screening Committee. *Screening tests for your baby*. Leeds: National Screening Committee; 2007.
120. Hargreaves K, Sinclair J, Oliver S. *Evaluation of the UK Newborn Screening Programme Centre information resources*. London: UK Newborn Screening Programme Centre; 2007.

121. UK Newborn Screening Programme Centre. *Newborn blood spot screening in the UK: Policies and Standards*. London: UK Newborn Screening Programme Centre; 2005.
122. UK Newborn Screening Programme Centre. *Guidelines for newborn blood spot sampling*. London: UK Newborn Screening Programme Centre; 2008.
123. Department of Health. *Facing the future: a review of the role of health visitors*. London: Department of Health; 2007: 1–35.
124. Qureshi N, Modell B, Modell M, Qureshi N, Modell B, Modell M. Timeline: Raising the profile of genetics in primary care. *Nat Rev Genet* 2004;**5**:783–90.
125. Charnock D, Shepperd S, Needham G, Gann R. DISCERN: an instrument for judging the quality of written consumer health information on treatment choices. *J Epidemiol Community Health* 1999;**53**:105–11.
126. Shepperd S, Farnon P, Grainge V, Oliver S, Parker M, Perera R, *et al*. DISCERN-Genetics: quality criteria for information on genetic testing. *Eur J Hum Genet* 2006;**14**:1179–88.
127. Treadwell MJ, McClough L, Vinchinsky E. Using qualitative and quantitative strategies to evaluate knowledge and perceptions about sickle cell disease and sickle cell trait. *J Natl Med Assoc* 2006;**98**:704–10.
128. Ballas SK, Park D, Wapner RJ. Neonatal screening for sickle cell disease in a metropolitan university hospital: efficacy and problems. *J Med Screen* 1994;**1**:229–32.
129. Velazquez KB, Cunningham GC. *Haemoglobin trait carrier follow-up: the California Model*. Berkeley, CA: US Department of Health Services; 1995.
130. Day SW, Brunson GE, Wang WC. Successful newborn sickle cell trait counseling program using health department nurses. *Pediatr Nurs* 1997;**23**:557–61.
131. Farrell PM, Kosorok MR, Rock MJ, Laxova A, Zeng L, Lai H, *et al*. Early diagnosis of cystic fibrosis through neonatal screening prevents severe malnutrition and improves long-term growth. *Paediatrics* 2001;**107**:1–13.
132. Stewart R, Hargreaves K, Oliver S. Evidence informed policy making for health communication. *Health Educ J* 2005;**64**:120–8.
133. Dillard JP, Shen L, Tluczek A, Modaff P, Farrell PM. The effect of disruptions during counselling on recall of genetic risk information: The case of cystic fibrosis. *J Genet Couns* 2007;**16**:179–90.

Appendix I

Communication of newborn carrier
results: summary of primary studies
that include relevant data

Author	Setting	Disease		Design	Methods	Participants	Sample	Findings [(#) = number of participants]
		CF	SC					
Grossman <i>et al.</i> (1985) ⁶⁷	USA	✓		Formative evaluation	Description of service, questionnaire	Parents of infants identified with sickle cell trait (AS or AC)	91	35% (32) of parents accepted carrier testing themselves Parents who received counselling showed an increase in knowledge, although 27% (25) did not recall the original session
Grover <i>et al.</i> (1986) ⁹¹	New York state, USA	✓		Formative evaluation	Description of city-wide follow-up services	Parents of haemoglobin trait carriers	2190	Parents had carrier testing themselves, 39 couples found to be at reproductive risk
Rowley (1989) ⁹⁰	New York, USA	✓		Cross-sectional	Unvalidated survey	Mothers of newborns with sickle cell trait	30	Great variation in perceived susceptibility of having an affected child Viewed prenatal diagnosis as reassuring if results negative
Tluczek <i>et al.</i> (1991) ⁸²	Wisconsin, USA	✓		Case-Control	Questionnaire	Parents: early diagnosis; control group	104; 11	Early diagnosis group generally understood that a positive IRT result meant that their child might have CF [76% (79)] Control group more confused about meaning of a positive IRT result When results communicated by phone rather than face-to-face (with a brochure) many had misconceptions and adverse emotional responses
Ballas <i>et al.</i> (1994) ¹²⁸	USA	✓		Formative evaluation	Description of service	Parents of infants tested for haemoglobinopathies,	170 sickle trait; 63 Hb C trait	Result letters sent to families of infants identified as carriers Only 16% (33) of families responded and asked for additional information, counselling or testing of other family members
Velazquez and Cunningham (1995) ¹²⁹	California, USA	✓		Formative evaluation	Unvalidated survey	Parents of child born with S, C, D trait	278	84% (232) remembered receiving the initial trait letter; 58% (150) remembered talking to the doctor about it, 25% (70) reported calling SC centre and of these: 88% (62) said their questions were answered, 65% (46) received counselling over the telephone, and 47% (33) made appointments to come into the centre

Disease								
Author	Setting	CF	SC	Design	Methods	Participants	Sample	Findings [(#) = number of participants]
Rao <i>et al.</i> (1996) ⁶⁵	Birmingham, UK	✓	✓	Formative evaluation	Description of service (reported in letter to journal)	Parents of haemoglobin carriers	146 carriers; 2 affected	Health visitors able to give most results with training and support
Baroni <i>et al.</i> (1997) ⁷³	Wisconsin, USA	✓		Case-control	Questionnaire	Mothers of false-positive CF results	14 case; 14 controls	Significantly less total parenting stress, but greater defensiveness in responding among families of false-positive screened children than controls
Day <i>et al.</i> (1997) ¹³⁰	West Tennessee, USA	✓		Formative evaluation	Description of service	Hospitals/clinics	27	Counselling following newborn screening is an opportunity to teach families who are potentially at risk
Mischler <i>et al.</i> (1998) ¹⁵	Wisconsin, USA	✓		Case-control	Unvalidated Questionnaire	Parents of children identified as carrier ^a	206 IRT, 109 IRT/DNA 1 year follow-up: 106 IRT, 63 IRT/DNA	Over 95% of families initially understood that their child definitely did not have CF 1 year later; 7% (7) IRT, 10% (11) IRT/DNA families still thought about results often/constantly 1 year later, more than half of the false-positive IRT/DNA families did not understand that they were at increased risk of having a child with CF
Yang <i>et al.</i> (2000) ⁶⁹	Alabama, USA		✓	Case-control	Questionnaire	Parents of SC carriers receiving prenatal sickle cell education vs controls	41; 606 controls	Parents who received prenatal sickle cell information retained significantly more information than controls
Ciske <i>et al.</i> (2001) ⁵⁸	Wisconsin, USA	✓		Cross-sectional	Unvalidated survey	Parents of children identified as CF carriers	138	Result communicated by: 8% (11) physicians, 12% (17) nurses, 33% (46) genetic counsellors, 18% (25) could not recall, 29% (40) did not receive genetic counselling 88% (121) understood their child was a carrier of CF 15% (21) were unsure whether being a carrier could cause illness Significant differences in correct responses between parents who received genetic counselling and those who did not

Author	Setting	Disease		Design	Methods	Participants	Sample	Findings [(#) = number of participants]
		CF	SC					
Farrell <i>et al.</i> (2001) ³¹	USA	✓		Cross-sectional	Unvalidated survey	Health professionals: screening programme follow-up co-ordinators	46	Counselling usually done by subspecialist physicians or specially trained nurses and counsellors Perception that the 'quality' of counselling by these professionals is better than by primary care physicians
Wheeler <i>et al.</i> (2001) ⁷⁰	Massachusetts, USA	✓		Formative evaluation	Description of service	Parents of a child detected with one CF mutation	102	96% (95) offered DNA-based carrier testing 82% (81) chose to have carrier testing
Curnow <i>et al.</i> (2003) ⁷¹	Victoria, Australia	✓		Clinical case	Description of service	Parents of carriers with specific mutations	4 (couples)	Parents wanted additional testing feeling it relieved anxieties and they had been informed fully
Parsons <i>et al.</i> (2003) ⁵⁹	UK	✓		Mixed method	Observation, questionnaire, interview	Families of an infant affected with CF; families of carriers; control mothers	9; 10; 82	All families in favour of screening Parents identified problems in service delivery protocol and genetic counselling practice
Lempert <i>et al.</i> (2004) ⁹⁹	UK	✓	✓	Qualitative	Semi-structured interviews	Parents: carriers of SC (5) and CF (5), or those asked for a repeat blood sample	23	Parents emphasised difficulties of the responsibility of knowing baby's genetic status, and trying to establish sense of closure At second blood sample, method of communication by health professional and level of information (verbal/written) influenced parents' experiences Issues about knowing child's genetic status; knowing own status; reproductive planning; discussing result with family Parents who had a repeat test but did not receive notification of normal result, found it difficult to get 'closure'
Campbell <i>et al.</i> (2005) ¹¹⁸	Chicago, USA	✓	✓	Qualitative	Focus groups	Parents: community sample with no experience of newborn screening specified	12 focus groups; N = 102	8/12 focus groups reported parental 'right to know' child's carrier status Concerns about 'reproduction and marriageability' were raised No concerns that carrier information would negatively impact on child's self-image, yet most would discourage carrier-carrier mating

		Disease						
Author	Setting	CF	SC	Design	Methods	Participants	Sample	Findings [(#) = number of participants]
Comeau et al. (2005) ¹¹⁴	Massachusetts, USA	✓		Cluster trial	Service uptake evaluation	Parents: screened positive children	590 (10 CF affected, 580 carriers)	Parents more likely to complete genetic counselling if offered on the same day than if asked to return another day
Farrell et al. (2005) ¹⁰⁶	Wisconsin, USA	✓	✓	Qualitative: content analysis	Simulated communication of newborn carrier results	Health professionals: paediatric residents	30 residents, 59 transcripts	9% (5) of transcripts contained key content 27% (16) included reassuring news within first 10% of communication Disease information most common topic [22% (13) of statements]
Hargreaves et al. (2005) ⁸¹	South-East, UK	✓	✓	Qualitative	Semi-structured telephone interviews and focus groups	Parents of children affected/unaffected by screened conditions; screening health professionals	47; 35	Tension between informed choice in newborn screening and public health screening for children More information and better communication may help Argues for need to take into account parents information needs
Kemper et al. (2005) ⁶¹	Columbia, USA	✓	✓	Qualitative	Telephone survey	Health professionals: newborn screening programme co-ordinators across USA	51 ^b	Communication protocols varied considerably Unclear if parents given adequate, timely information Parents whose first language is not English are especially uninformed
Kladny et al. (2005) ⁴¹	Western Pennsylvania, USA		✓	Before and after	Service uptake evaluation	Service data: service uptake data	3789 (3095 retrospectively sampled) normal service provision vs 694 (prospectively sampled) enhanced follow-up ^c	Normal service provision: 5% (165) counselling by telephone 2% (60) extended family testing Enhanced follow-up: 48% (333) counselling by telephone 18% (66) extended family testing 14% (99) requested educational videos 95% (41) video answered trait queries 92% (40) decreased anxiety 92% (40) able to distinguish between trait and disease

		Disease						
Author	Setting	CF	SC	Design	Methods	Participants	Sample	Findings [(#) = number of participants]
Lagoe <i>et al.</i> (2005) ⁸⁹	New York, USA	✓		Randomised controlled trial	Unvalidated questionnaire	Parents of children with elevated screening result	61 (27 standard ^d vs 34 special care)	1 year follow-up parental testing: Standard care: 27% (6) parents tested Special care: 50% (17) parents tested
La Pean and Farrell (2005) ⁴⁰	Wisconsin, USA	✓	✓	Qualitative: content analysis	Simulated communication off newborn carrier results	Health professionals: paediatric residents	30 residents, 59 transcripts	69% (41) transcripts contained bad news statements before good news statements More misleading statements in CF communications than in SC (90% vs 50%) Mean number of misleading statements 5.5 Mean number of statements between bad and good news statements 28.1
Truczek <i>et al.</i> (2005) ⁶⁰	Wisconsin, USA	✓		Mixed methods	Grounded theory interviews; Depression scale	Parents: children with elevated screening result	28 parents from 14 families	High levels of distress while waiting for confirmatory results Depression scores of parents of child with abnormal screening result significantly higher than controls Parent's cognitive uncertainty and emotional distress mediated by prior knowledge of screening, disease, own carrier status; adjustment to infant; physician's informing style Coping mechanisms: pursuing further testing, seeking information, assessing child for symptoms, social support, praying, social withdrawal
Stewart <i>et al.</i> (2005) ¹³²	UK	✓		Qualitative	Focus groups, interviews	Parents: with babies newborn screened Health professionals: involved newborn screening	21; 31	Least popular proposal for developing screening information was developing a video for parents, 45% (23) agreement, 43% (22) neither agree/disagree, 12% (6) disagree
Wilfond and Gollust (2005) ¹⁰¹	11 US states where screening occurs	✓	✓	Qualitative	Telephone interviews	Health professionals: programme representatives	11	Different screening and information protocols Family physicians most frequent informants

Disease								
Author	Setting	CF	SC	Design	Methods	Participants	Sample	Findings [(#) = number of participants]
Zavataro et al. (2005) ⁷⁴	Florence, Italy	✓		Cross-sectional	Parental anxiety measured by trained operators using unvalidated measure	Parents: awaiting results	24 calls to NBS centre during 1 month	37% (9) highly anxious; 46% (11) low anxiety 58% (14) of questions regarding CF 42% (10) of questions on NBS procedure 25% (6) called more than once 33% (8) received CF information elsewhere
Davis et al. (2006) ⁹³	Louisiana, Maryland, New Mexico, Texas, USA	✓	✓	Qualitative	Focus groups and interviews	Parents of screened children Health professionals: screening professionals; providers of care for affected children	22 focus groups and 3 interviews of parents (n = 51); 79 interviews of screening professionals	Parents want brief information on screening and benefits Parents wanted information to be presented orally accompanied by easy to read leaflet in third trimester Health professionals sought a communication check list and resources
Grob (2006) ⁹⁷	Bronxville, USA	✓		Qualitative	Semi-structured interviews	Parents: child affected	25	Parents may simultaneously experience positive feelings regarding the identification of their child's disease and resentment regarding the impact the diagnosis had on their bonding with their child in the neonatal period
Kemper et al. (2006) ¹⁰⁷	USA	✓	✓	Cross-sectional	Unvalidated survey	Health professionals: general paediatricians and family physicians	207; 143	64% (132) paediatricians, 77% (110) family physicians perceive need for families with SC carrier child to receive genetic counselling 82% (170) paediatricians, 87% (124) family physicians perceive need for families with CF carrier child to receive genetic counselling
Lewis et al. (2006) ⁶³	Victoria, Australia	✓		Cross-sectional	Unvalidated survey	Parents of carriers identified 1996–7; 2001	66: (31 1996–7); (35 2001)	97% (30) 1996/97 and 100% (35) 2001 recalled child was identified as CF carrier 70% (21) 1996/97 and 49% (17) 2001 unaware screening could detect carriers 28% (9) 1996/97 and 18% (6) 2001 had residual anxiety about child's current health and reproductive decisions
Quinlivan et al. (2006) ⁹²	Victoria, Australia	✓		Cross-sectional	Structured interviews	Parents who received written and verbal screening information	200	86% (172) support newborn screening to prevent/reduce disease 65% (130) support newborn screening to inform family planning

Author	Setting	Disease		Methods	Participants	Sample	Findings [(#) = number of participants]
		CF	SC				
Tluczek <i>et al.</i> (2006) ⁹⁶	Wisconsin, USA	✓		Qualitative	Parents: infants had abnormal CF results	33 (25 were carriers)	<p>Factual information sought: likelihood of CF diagnosis, information on CF, sweat test procedure, genetics</p> <p>Emotional support sought: empathy for distress, instilling hope, personalised counselling, providing hospitality</p> <p>Parents valued control over information timing and amount</p>
Treadwell <i>et al.</i> (2006) ¹²⁷	California, USA		✓	Mixed method (cross-sectional survey and focus group)	<p>Focus groups: health-care providers; people affected with SC; community members</p> <p>Interviews: community members</p>	<p>3 focus groups, 282 interviews</p>	<p>16% (45) knew own carrier status</p> <p>Prominent beliefs:</p> <p>70% (197) carriers have health problems</p> <p>31% (87) carriers can develop the disease</p> <p>82% (230) carrier can have affected child</p> <p>78% (220) carrier child can have affected child</p> <p>Men ($p < 0.05$) and participants ≤ 33 ($p < 0.05$ with univariate analysis) were more likely to believe SC could be acquired through blood transfusions</p>
Dillard <i>et al.</i> (2007) ¹³³	Madison, USA	✓		Before and after	Parents: children identified as carriers following sweat tests	40	<p>Severity of disruptions during counselling sessions was negatively associated with memory for genetic information 6 weeks after counselling ($p < 0.05$)</p> <p>Disruption severity positively associated with impact on counselling ($p < 0.05$)</p> <p>Impact on counselling positively associated with memory of genetic risk information 6 weeks after counselling ($p < 0.05$)</p> <p>Prior knowledge of genetic risk was positively associated with later knowledge ($p < 0.05$)</p> <p>Knowledge significantly increased 6 weeks after counselling ($p < 0.05$)</p>

Disease								
Author	Setting	CF	SC	Design	Methods	Participants	Sample	Findings [(#) = number of participants]
Moran <i>et al.</i> (2007) ⁷⁹	Leeds, UK	✓		Qualitative	Semi-structured interviews	Parents: children with false positive results	21	Waiting for results is distressing, mediated by prior knowledge Results can lead to hypervigilance and misconceptions 71% (15) report health visitor suitable result communicator Knowledgeable health professionals valued All parents happy to receive result by phone
Munck <i>et al.</i> (2007) ¹⁰³	Austria, France, UK, Czech Rep, Spain, Italy and Wales	✓		Cross-sectional	Unvalidated Questionnaire	Health professionals: CF newborn screening centres across Europe	17 centres	Results communicated by paediatrician 52% (9) or CF geneticist 41% (7) in the majority of cases DNA testing of parents suggested in 14 centres (82%) In UK parents are provided with information sheet and support from community nurses
Parsons <i>et al.</i> (2007) ⁹⁵	Wales, UK	NA	NA	Qualitative	Semi-structured interviews	Parents: who had recent experience of being offered newborn screening	18	Majority were unsatisfied Information given at emotionally charged time is difficult to recall Information not prioritised over other events
Farrell <i>et al.</i> (2008) ¹⁰⁰	Wisconsin, USA	✓	✓	Qualitative: content analysis	Simulated communication of newborn carrier results	Health Professionals: paediatric residents	30 residents 59 transcripts	Average use of jargon 20 words per transcript Average jargon explanations 7.5 per transcript Time lag between jargon use and explanation 8.2 statements
Grob (2008) ⁹⁴	Bronxville, USA	✓		Qualitative	Semi-structured interviews	Parents: child diagnosed via newborn screening or symptomatically	35	Waiting for result hardest part of diagnostic experience Parents evaluated child for symptoms Parents focused on child's mortality
Kavanagh <i>et al.</i> (2008) ⁶²	Across, USA		✓	Cross-sectional	Unvalidated postal survey	Health Professionals: follow up co-ordinators	52 (1 from each state; 1 from Columbia district and 2 from Georgia)	Notification of SC trait results: 88% (46) primary care providers; 63% (33) hospitals; and 37% (19) families 33% (17) no protocols to ensure positive SC results were received

Author	Setting	Disease		Methods	Participants	Sample	Findings [(#) = number of participants]
		CF	SC				
Locock and Kai (2008) ⁹⁸	Primary and community care settings across England	✓	✓	Narrative interviews	Parents: carrier information conveyed following antenatal or newborn screening	39 people (9 NBS experience)	Unaware screening performed thus communication of results lead to shock or surprise Valued being notified of carrier status Perception carrier information more useful prior to conception or relationship. Satisfied with information but fundamental gaps in knowledge identified Identified need for better preparation of parents prior to screening
McClaren et al. (2008) ¹⁰⁵	Victoria, Australia	✓		Focus groups, interviews	Pregnant couples: couples before conception; people with family history of CF Health Professionals: GPs and obstetricians	4 focus groups and 32 interviews with 68 pregnant couples, people family history of CF, GPs, obstetricians and other screening health professionals	People unlikely to request testing unless offered by health professional or had family history Supported preconceptional screening as maximum reproductive choices available; School testing supported as enables widest population to be reached Leaflets valued for reference Health professionals reluctant to offer CF screening routinely due to concerns about psychosocial impact and increased communication workload

NBS, Newborn Screening.

a This paper reports some of the findings from the larger Wisconsin CF Neonatal Screening project which investigated 650,340 infants between 1985 and 1994.

b 51 represents all the NBS programmes co-ordinators across the USA.

c Enhanced follow-up: result letters, telephone calls, offer of educational video or genetic counselling.

d Standard care [results over telephone: parents advised to seek genetic counselling and parental testing; special care (genetic counselling and parental testing on day of sweat test)].

Appendix 2

HTA 04/10 Disclosing carrier status information following newborn screening

*Revised proposal submitted/approved
November 2005*

Title: Communication of carrier status information following newborn screening: descriptive study of current practice, methods and experience

How the proposal has been revised

The study is now limited to those objectives and methods (proposed within Phase One and descriptive elements of submission in June) requested by the HTA Programme Director (letter of 18 August 2005 and additional suggestions from reviewers). This work is intended to help the HTA to consider whether and what further research may be necessary concerning communication of carrier status information following newborn screening.

Planned investigation

Aim

To describe, explore and synthesise current practice, methods and experience of communicating carrier status information following newborn screening to inform practice and potential further research.

Objectives

1. To describe current practice and methods of communicating newborn carrier status information, and synthesise experience of their feasibility and effectiveness.
2. To explore, in depth, parents' experiences and views on the impact of being told of their baby's carrier status, whether and how this information is shared within families, and their satisfaction with methods of being informed.
3. To establish views of health professionals who communicate carrier status information about the acceptability, feasibility and effectiveness of, and preference for methods of informing parents.

I. Review of existing research

Knowledge of a baby's carrier status and its implications may be helpful as this can have reproductive implications for both the child and the parents, including identification of couples at risk for future children with disease, even though the child is not ill¹. Research with parents following screening supports disclosure of newborn carrier status (Oliver *et al.*, 2004). However evidence on current practice and methods for disclosing and communicating information about carrier status, and parents' and health professionals' views of such methods is lacking. This is now needed to inform practice and potential further research.

Two HTA-commissioned reviews of sickle cell (SC) and thalassaemia antenatal and newborn screening focus on cost-effectiveness, rather than methods and effects of communicating results (Davies *et al.*, 2000, Zeuner *et al.*, 1999). Similarly most work on newborn screening for cystic fibrosis (CF) has considered effectiveness and cost (Pollitt *et al.*, 1997), potential outcomes (Laird *et al.*, 1996), or programmes for CF (Farrell *et al.*, 2001; Wildhagen *et al.*, 1998), with limited evidence of the impact of disclosing results (Murray *et al.*, 1999; Merelle *et al.*, 2000) or of parents' experiences of newborn screening (Green *et al.*, 2004). More recent work on newborn bloodspot screening has focused on parent and professional views about informed choice when offered screening (Hargreaves *et al.*, 2005), and appraisal of information sources used to convey the benefits of screening (Hargreaves *et al.*, 2005b; Stewart *et al.*, 2005), rather than methods for communicating outcomes such as carrier status.

A systematic review identified no controlled trials of interventions to disclose newborn carrier status to parents (Oliver *et al.*, 2004), but a number of descriptive studies on newborn screening for SC (Anionwu, 1983; Grossman *et al.*, 1985; Hurst, 1989; Rao *et al.*, 1996; Whitten *et al.* 1981; Yang *et al.*, 2000) and CF (Ciske *et al.*, 2001; Curnow *et al.*, 2003; Moran *et al.*, 2003; Parsons *et al.*, 2003; Tluczek *et al.*, 1991; Mischler *et al.*, 1998; Wheeler *et al.*, 2001). These studied parents' views but were limited in terms of number and selection

of participants, and reporting of socioeconomic data. They indicate that parents favour newborn screening and the reporting of carrier status to them, and anticipate telling their child. There is little evidence that disclosure of carrier status has significant impact on most families' reproductive plans or behaviour, nor that anxiety, mother–baby relationship or parental behaviour toward their carrier child is adversely affected. Discussing carrier status with the wider family was perceived as necessary but difficult, and there was some preference for results to be communicated by a familiar, non-specialist or primary care professional.

There are little data available to inform methods for communicating carrier status. A recent qualitative study (Lempert *et al.*, 2004) explored 23 parents' experiences following newborn screening (the sample included five with SC carrier results and five with CF carrier results). Parents emphasised three needs: retaining knowledge of genetic status for future information; their own status, whether known or not known, in relation to reproductive planning; and discussing screening results with the wider family. In the USA, where newborn screening for SC disorders began three decades ago and has been mandatory in most states, there is similar diversity to the UK in methods for communicating newborn carrier status (see 2.4 below). However promising experiences with communication of carrier status by telephone following postal notification, 'in-person' counselling, use of mailed audiovisual information, or discussion with primary care provider have been reported in service reports and observational work (Velazques and Cunningham, 1995; Kladny *et al.*, 2005).

In summary there is a paucity of evidence relevant to the proposed study objectives. There have been no controlled trials of interventions to disclose newborn carrier status to parents, and there is no sound evidence about the impact of communication or effective methods of doing so (Oliver *et al.*, 2004). Further, little or no evidence is available on whether outcomes vary by parents' previous knowledge of the screened condition, methods of communication or which health professional communicates the information, or on the views of health professionals involved.

2. Background to proposed study

2.1 Policy context

As part of the NHS Plan (2000), new universal newborn (neonatal) screening for SC disorders is now fully implemented across England, with phased introduction of antenatal screening for SC and thalassaemia (universal in high prevalence areas, selective in low prevalence) well underway (NHS Sickle Cell & Thalassaemia Screening Programme, www.newbornscreening-bloodspot.org.uk/). The UK Newborn Screening Programme aims to implement universal newborn screening for CF in England by April 2007. Currently 20% of newborns are already screened for CF in England (areas served by laboratories in East Anglia, Trent, Northampton and Leeds) and all newborns in Northern Ireland (biochemical screening since 1985, DNA testing to start in April 2006), Wales (since 1996) and Scotland (since 2003).

Guidance on newborn screening policy (UK Newborn Screening Programme Centre, 2005) recommends that parents must be informed if their babies are identified as SC or CF carriers following newborn screening and, where feasible, communication of this information should be made in person by a suitable health professional.

2.2 Conditions to be studied

Although designed to detect affected individuals, some newborn screening programmes inadvertently identify newborn infants who are carriers of the inherited conditions. Current expansion of newborn blood spot screening in England (well established for phenylketonuria and congenital hypothyroidism) to include SC and CF will increase numbers of carriers so identified.

Screening for SC identifies all carriers of haemoglobin variants (no available method of testing without detecting carriers), whereas current laboratory screening for CF aims to exclude carrier detection as far as possible. Thus numbers of SC carriers detected are considerable in comparison to CF carriers (e.g. 300 SC carriers detected in the East Midlands in a 12-month period compared to 27 CF carriers)². SC carriers are healthy. CF carriers require a repeat test after initial screening and have a small risk (1:15) of developing the condition, and newborn screening is not preceded by antenatal screening.

How parents may respond to being told of their baby's carrier status or how information about this is communicated may potentially be unlikely to differ markedly between the two conditions. However, differences in carrier status implications, newborn alone or linked antenatal and newborn screening, and numbers of newborn carriers identified may necessitate different approaches.

2.3 Prevalence

Following newborn SC screening, between 17 and 100 heterozygous carriers of abnormal haemoglobin traits will be identified for each affected baby detected. With a national prevalence of 1.2–1.3% of annual births, this equates to an estimated 9000 newborn carriers per year³.

Cystic fibrosis has a slightly lower incidence (1:2500 babies per year born in the UK) and approximately 1 in 25 of the population is estimated to be a carrier. As mentioned above, current CF screening tests aim to exclude identification of carriers, therefore only a small number of actual carriers will be identified following newborn screening.

2.4 Lack of information about current UK practice

Current UK practice for informing parents of SC or CF carrier status varies according to local protocols. Most screening laboratories inform a nominated health professional or service to communicate the result to parents, and may routinely also inform the baby's general practice. Methods include verbal notification or use of a letter with relevant information, often with an offer of appointment to discuss with a health professional. Who communicates this information and how, and what information resources may be used vary. The former may typically be SC counsellors, genetic counsellors/clinical genetic or specialist nurse services, with members of the primary health care team such as a GP or health visitor sometimes copied into their correspondence and variably involved. Lack of data to assess current practice makes it unclear as to what extent parents receive notification or access further information. In contrast to varied current practice, the UK Newborn Screening Programme Centre has recently recommended that results of babies identified as CF or SC carriers should be given in person. Descriptive data on what current practice comprises and on how best to communicate carrier information are now needed.

3. Investigation

3.1 Review of current practice

Objective 1: To describe current practice and methods of communicating newborn carrier status information, and synthesise experience of their feasibility and effectiveness.

Given the dearth of published research about methods for communicating carrier status and the absence of controlled trials of interventions (Oliver *et al.*, 2004), the wide diversity of practice and current methods of informing parents of SC or CF carrier status will be examined and reviewed.

Methods

A postal questionnaire survey (and/or the same survey by email) will be sent to all newborn screening laboratories and regional child health screening co-ordinators in England, and their equivalent elsewhere in the UK. This will seek details of current or planned practice and methods for disclosing and communicating carrier status information, how and by whom parents are informed, what is perceived to work and what does not, and challenges and suggestions for how current practice could be improved. Respondents will also be asked to suggest potential strategies to recruit parents of newborn carriers for qualitative study (see 3.2 below). Non-responders will be followed up by telephone.

This information will be used to describe and categorise current practice, methods and their contexts, highlighting perceived advantages or disadvantages, with perceived experience and evidence of the feasibility and effectiveness of different methods.

3.2 Qualitative study with parents

Objective 2: To explore, in depth, parents' experiences and views on the impact of being told of their baby's carrier status, whether and how this information is shared within families, and their satisfaction with methods of being informed.

Research questions

1. What is the impact on a family of being informed of newborn carrier status?
2. How well is carrier status information understood?
3. Is this information shared within the immediate and wider family, how and what support may be needed to do so?

4. What are parents' views of the way in which they were informed, information provided, and support offered/received?

Sampling

Parents who have been informed of their newborn's SC or CF carrier status will be purposively sampled for in-depth qualitative interview on the basis of how (method) they were informed, sociodemographic and ethnic characteristics, residence in a high or low prevalence area and, where feasible, the 'stage' of information process (shortly after being informed or about 6 months later). It is anticipated parents of approximately 50 newborn carriers (25 SC and 25 CF) may be interviewed, unless saturation occurs earlier, requiring smaller samples.

Research setting

Sampling will initially take place in the West and East Midlands where universal newborn screening for both SC (West and East Midlands) and CF (East Midlands) is already implemented. Moreover these regions have diverse practices for informing parents, varying areas of socioeconomic and ethnic diversity, varying prevalence of SC carrier status, and offer the practical advantages of existing close collaborative relationships between the research team and service stakeholders. Further sampling of parents will nevertheless include other regions of England as appropriate, particularly those where universal screening for CF is being piloted or where practice for informing parents of newborn carrier status differs markedly from the West and East Midlands.

Recruitment and consent

It is recognised that recruiting parents for interview may be challenging, particularly because a national sample will require multisite, potentially complex, NHS R&D governance approvals. Moreover identifying a sufficient sample of parents of CF carrier babies for interview may be lengthy and time consuming, as actual numbers detected by current newborn screening are small (see 2.2 above) and newborn screening for CF is currently universal in only 20% of England. Anticipating these challenges, the research team will be guided by a preceding survey of screening service stakeholders (see 3.1 above) and work closely with practitioners to secure sample access and recruitment. The research team will seek explicit endorsement of the study from the UK National Screening Committee to further facilitate this,

and build on current collaborations with newborn screening laboratories and child health screening co-ordinators.

Potential participants (parents who have been informed that their child is a SC or CF carrier) will be identified and approached by child health screening co-ordinators in the first instance. These practitioners will seek their permission to pass contact details to the research team, who will send study information and request written consent, translated where appropriate. To ensure that parents contacted by screening co-ordinators have definitely received communication about carrier status, prior contact with local practitioners responsible for informing parents, e.g. haemoglobinopathy counsellors, genetic counsellors or specialist nurses, will be made by screening co-ordinators. This strategy has also appeared effective in recruiting pregnant haemoglobinopathy carriers, including Pakistani women, elsewhere (Ahmed *et al.*, 2005).

Given the likely challenges of recruitment, we envisage that other recruitment strategies may be required. If necessary, we will review and adjust our recruitment methods, within ethical constraints and by submitting amendments to ethics approval, to maximise opportunities for participation. For example, attempts to encourage participation may be made via the parents' GP or health visitor.

Data generation and analysis

Semi-structured face-to-face interviews (Britten, 1995) will be conducted at respondents' convenience (parents' home or elsewhere), with respondents given the option of being interviewed in English or their mother tongue as appropriate. Interviews will be undertaken by the project researchers and, where necessary, by sessional research staff with appropriate bilingual skills working with the research team, or with the support of an appropriate interpreter, using current best practice and our recent experience in this regard (Edwards, 1998; Bush *et al.*, 2003).

The interviews will follow broad topic areas based upon the above research questions (1–4), using a topic prompt modified and refined following early interviews, and also including exploration of anxiety created by carrier status information, prior knowledge of the condition, understanding of concepts and information received and reproductive intentions. Wider issues related to the

experience of receiving carrier status information, e.g. potential concerns around non-paternity, will be explored if raised, and potential non-benefits or harms experienced or perceived, but respondents will be encouraged to discuss their perceptions and experiences freely. Willingness to be approached again for telephone interview as part of validation of findings will be sought (see below). Interviews will be audio-taped and transcribed verbatim.

Data will be analysed using constant comparative analysis (Strauss and Corbin, 1990) by the project researchers, with the wider team from different disciplinary, professional and cultural backgrounds (JK, HP, NQ) contributing to development of the analysis and conceptual framework to maximise theoretical sensitivity. Analysis will acknowledge the impact where appropriate of the use of interpreters during data generation (Edwards, 1998). Coding will be aided by application of NVIVO software in identifying emerging categories and concepts from the data. Data generation and analysis will be iterative, each informing the other, with the seeking of deviant cases (Mason, 1996) and further theoretical sampling and data collection to extend and challenge earlier data and interpretation. This will test the integrity and credibility of the analysis, until no new categories or concepts emerge suggesting theoretical saturation.

Validation

Findings will be fed back and reviewed with a sample of up to a third of parent participants, who were willing to be approached again. This will be by telephone interview following distribution of written summaries, translated where appropriate. Respondents will be asked to consider and comment on the results, enabling the research team to triangulate findings and confirm or further refine data interpretation and analysis if appropriate.

3.3 Descriptive study with health professionals

Objective 3: To establish views of health professionals who communicate carrier status information about the acceptability, feasibility and effectiveness of, and preference for methods of informing parents.

Methods

Health professionals involved in communicating information about newborn SC or CF carrier status to parents will be purposively sampled

for individual qualitative interview by telephone informed by a preceding survey (see 3.1 above) and the experience of sampling parents (see 3.2 above) to include professionals using different methods of informing parents, specialist counselling and primary care professionals, and practice in a range of contexts (e.g. differing patient populations and potential needs). Telephone interviews are considered an acceptable alternative to face-to-face interviews in qualitative research (Sturges, 2004), and have been selected here as a pragmatic and cost-effective method for interviewing busy health professionals in various locations across the country.

Up to 20 health professionals will be interviewed to explore experiences and views on acceptability, feasibility and effectiveness of the different methods of informing parents used, and their preferences including perceptions of attendant service organisational issues and professional training needs. Professionals' views of communication processes and information materials used, suggestions for improvement to current practice, and strategies adopted for different cultural and language groups will be elicited. Interviews will be audio-taped and data analysed by sorting key emergent findings under common themes.

Validation

A written synopsis of key themes from health professional interviews will be posted to all participants, inviting comments for consideration by the research team.

3.4 Output

A final project report will include review of relevant literature published since the recent systematic review on disclosing newborn carrier status (Oliver *et al.*, 2004), and will offer discussion and recommendations regarding the need for and nature of further research required. A draft final report will be sent to key NHS stakeholders (see 4.5 below) including the UK National Screening Committee, the UK Newborn Screening Programme Centre, the NHS Sickle Cell and Thalassaemia Screening Programme, the NHS Cystic Fibrosis Screening Programme, and academic experts (including representatives from the appropriate commissioning group of the HTA Programme if deemed appropriate by the HTA). This will seek to establish firstly whether there is sufficient information to inform best practice when

disclosing and communicating information about newborn carrier status, or whether further research is required. Secondly, if further research is needed, to specify appropriate research questions, and how (best method) they might be answered, including, if appropriate, likely interventions that may be compared.

4. Research management

4.1 Ethical arrangements

The research will be undertaken within the NHS Research Governance Framework following MREC, LREC and Trust R&D approvals. Potential interview respondents will be informed about the risks and benefits of participation, and informed consent obtained, using appropriate and translated information materials in different formats.

4.2 Steering group

A steering group, meeting on three occasions during the lifetime of the project will oversee the research and monitor progress against milestones and adherence to the study protocol. Membership will include a Chair and one other member, who will be experienced health service researchers independent of the investigators' institutions, up to three representatives of professional groups and consumers, the principal investigator and a nominated co-investigator as appropriate to project stages.

4.3 Project management

The principal investigator and co-investigators will meet regularly (3 monthly) throughout the duration of the study. Day-to-day management, including management and supervision of the research fellow, will be undertaken by a senior research fellow (HP), working closely with Professor Kai.

4.4 Expertise of research team

Our multidisciplinary team has extensive R&D expertise relevant to this study: JK, HP, NQ, qualitative methods in health services research, including primary and community care, ethnicity, genetics; SG, expertise on US newborn screening; BM, MM, community genetics, haemoglobinopathy and CF screening, including development of information materials. There are close links with PEGASUS, a programme and network directed by JK offering genetics training for the range of

health professionals involved in antenatal and newborn screening in England, using SCT as a model (www.pegasus.nhs). The team and study benefit from the confirmed close collaboration of service and service user colleagues (see 4.5 below), current relevant research (see CVs), and co-operation from expert advisors on trial design (Denise Kendrick) and psychological aspects (Cris Glazebrook, Reader in Health Psychology, University of Nottingham and Penny Standen, Professor in Health Psychology and Learning Disabilities, University of Nottingham).

4.5 Existing relationship with NHS colleagues

We are well placed to conduct the proposed research. Key NHS genetic service colleagues are already closely involved with development and implementation of the PEGASUS initiative. The proposal also builds on our existing research collaborations in the proposed NHS settings including work on newborn screening in low prevalence areas (with LM), and access and equity in genetic services (with CmcK, LM, SH). In addition, local NHS colleagues (haemoglobinopathy and genetic counsellors) are willing to help facilitate access to study participants by approaching parents for their permission to pass contact details to the research team.

Named NHS collaborators who have indicated their support for and collaboration with the study include West Midlands Regional Genetics Service (C McKeown, Consultant in Clinical Genetics; S Khan, A Ahmad, L Mathers, Genetic Counsellors); Regional Antenatal Screening Coordinator in W Midlands & Perinatal Institute (S Hodgkiss); National Lead for Child Health Screening and W Midlands Child Health Screening Coordinator (G Augustine); Chief Executive of PCT Specialised Commissioning Services for West Midlands (S Christie), Directors of Nursing in the PCTs of Birmingham (V Jones, S Ali), SCT counselling services in Birmingham (L Miller, S Crawford), Director of Newborn Screening Laboratory in West Midlands (A Green); PEGASUS education network of professionals involved in haemoglobinopathy screening including members of user (UK Thalassaemia Society; Sickle Cell Society) and professional groups (Sickle Cell & Thalassaemia Association of Counsellors; UK Forum on Haemoglobin Disorders).

5. Project timetable

Months	Research activity/stage
-5 to 0	Application for ethical approval (MREC, LREC, NHS Trust), recruitment of research staff, development of questionnaire
0-3	Questionnaire survey of current national practice and analysis, preparation of topic guides for qualitative interviews
4-14	Recruitment for and conduct of qualitative interviews with parents and health professionals, transcription and translation, analysis of early interviews
15-20	Analysis, validation and write-up

Justification for support requested

We require a senior research fellow to undertake day-to-day project management, lead ethics and other governance, develop study materials, be a stakeholder liaison, deal with aspects of fieldwork, supervise a research colleague, identify and address cultural/language issues for the study, and be responsible for leading the analysis and final report write-up. In addition, a second, experienced (given the sensitivity of the topic and skills required when interviewing parents) researcher is necessary to implement the questionnaire survey (including data entry and analysis) and lead and conduct, analysis, validation and write-up of the qualitative interviews. To accommodate the anticipated lengthy and complex process for recruiting a parent sample for interview, this post will be part-time for the full duration of the study.

Other costs sought include those to support travel (multiple sites, considerable NHS liaison, recruitment and data collection); meetings of the steering group; equipment and support for research staff; recording equipment; qualitative interview transcribing; costs of producing study information, and questionnaires; interpreting and translation costs; and other costs (stationery, photocopying, telephone).

6. References

- Ahmed S, Green J, Hewison J (2005). Antenatal thalassaemia carrier testing: Women's perceptions of 'information' and 'consent'. *J Med Screen* **12**:69-77.
- Anionwu EN (1983). Sickle cell disease: screening and counselling in the antenatal and neonatal period. *Midwife Health Visit Community Nurse* **19**:440-3.
- Britten N (1995). Qualitative interviews in health services research. *BMJ* **311**:251-3.
- Bush J, White M, Kai J, Bhopal R, Rankin J (2003). Understanding influences on smoking in Pakistani and Bangladeshi communities: community based qualitative study. *BMJ* **326**:962-6.
- Ciske DJ *et al.* (2001). Genetic counselling and neonatal screening for cystic fibrosis: an assessment of the communication process. *Pediatrics* **107**:699-705.
- Curnow L *et al.* (2003). Genetic counselling after carrier detection by newborn screening. *Arch Dis Child* **88**:886-8.
- Davis SC *et al.* (2000). Screening for sickle cell disease and thalassaemia: a systematic review with supplementary research. *Health Technol Assess* **4**(3).
- Department of Health (2003). *Our inheritance Our Future: Realising the potential of genetics in the NHS*. The Stationery Office, London.
- Edwards P *et al.* (2004). Increasing response rates to postal questionnaires: systematic review. *BMJ* **324**:1183-5.
- Edwards R (1998). A critical examination of the use of interpreters in qualitative research process. *J Ethnic Migrat Stud* **24**:197-208.
- Farrell M *et al.* (2001). Genetic counselling and risk communication services of newborn screening programs. *Arch Pediatr Adolesc Med* **155**:120-6.
- Green JM *et al.* (2004). Psychosocial aspects of genetic screening of pregnant women and newborns: a systematic review. *Health Technol Assess* **8**(33).
- Grossman LK *et al.* (1985). Neonatal screening and genetic counselling for sickle cell. *Am J Dis Child* **139**: 241-4.
- Hargreaves KM, Stewart RJ, Oliver SR (2005). Informed choice and public health screening for children: the case of blood spot screening. *Health Expect* **8**:161-71.
- Hargreaves K, Stewart R, Oliver S (2005b). Newborn screening information supports public health more than informed choice. *Health Educ J* **64**:110-19.
- Hurst D (1989). Newborn screening for sickle cell disease. *Pediatrics* **83**:868-71.

17. Kladny B, Gettig E, Krishnamurti L (2005). Systematic follow up and case management of the abnormal newborn screen can improve acceptance of genetic counselling for sickle cell or other haemoglobinopathy trait. *Genet Med* **7**:139–142.
18. Laird L, Dezateux C, Anionwu EN (1996). Neonatal screening for sickle cell disorders: what about the carrier infants? *BMJ* **313**:407–11.
19. Lempert T, Oliver S, Stewart R, Dezateux C (2004). *Communication of carrier results following newborn blood spot screening: parents and health professionals experiences*. Social Science Research Unit, Institute of Education, University of London.
20. Marteau TM, Dormandy E, Michie S (2001). A measure of informed choice. *Health Expect* **4**:99–108.
21. Mason J (1996). *Qualitative researching*. Sage: London.
22. Merelle ME *et al.* (2000). *Newborn screening for cystic fibrosis (Cochrane Review)*. The Cochrane Library.
23. Mischler E *et al.* (1998). Cystic fibrosis newborn screening: impact on reproductive behavior and implications for counseling. *Pediatrics* **102**:44–52.
24. Moran J *et al.* (2003). Newborn screening for CF in a regional paediatric centre: psychosocial effects of false-positive results on parents and re-evaluating service provision. *J Cystic Fibrosis* **S91–S97**.
25. Murray J *et al.* (1999). Screening for cystic fibrosis. *Health Technol Assess* **3**(8).
26. Oliver S *et al.* (2004). Disclosing to parents newborn carrier status identified by routine blood spot screening. *Cochrane Database Syst Rev* Issue 4. Art. No.: CD003859.pub2.
27. Parsons EP, Clarke AJ, Bradley DM (2003). Implications of carrier identification in newborn screening for cystic fibrosis. *Arch Dis Child Fetal Neonatal Ed* **88**:F467–71.
28. Pollitt RJ *et al.* (1997). Neonatal screening for inborn errors of metabolism: cost, yield and outcome. *Health Technol Assess* **1**(7).
29. Rao JN *et al.* (1996). Infants in Sandwell are screened for haemoglobinopathy gene [11]. *BMJ* **313**:1403.
30. Stewart R, Hargreaves K, Oliver S (2005). Evidence informed policy making for health communication. *Health Education Journal* **64**: 120–128.
31. Strauss A, Corbin J (1990). *Basics of qualitative research*. Newbury Park, CA: Sage.
32. Sturges JE (2004). Comparing telephone and face-to-face qualitative interviewing: a research note. *Qual Res* **4**:107–18.
33. Tluczek A *et al.* (1991). Psychological impact of false-positive results when screening for cystic fibrosis. *Pediatr Pulmonol Suppl* **7**:29–37.
34. Tymstra T (1986). False positive results in screening: experiences of parents of children screened for congenital hypothyroidism. *Fam Pract* **2**:92–6.
35. UK Newborn Screening Programme Centre (2005). *Newborn bloodspot screening in the UK: Health Professional Handbook*. www.ich.ucl.ac.uk/newborn/download/health_professional_handbook.pdf.
36. Velazquez K, Cunningham G (1995). *Haemoglobin trait carrier follow up: the California model*. Proceedings of Sickle Cell Trait Workshop, Texas. Association of Public Health Laboratories.
37. Wheeler PG *et al.* (2001). Genetic counselling after implementation of statewide cystic fibrosis newborn screening. *Genet Med* **3**:411–15.
38. Whitten CF *et al.* (1981). Sickle cell trait counselling – evaluation of counsellors & counselees. *Am J Hum Genet* **33**:802–16.
39. Wildhagen MF *et al.* (1998). Costs, effects, and savings of screening for cystic fibrosis gene carriers. *J Epidemiol Community Health* **52**:459–67.



Health Technology Assessment reports published to date

Volume 1, 1997

No. 1

Home parenteral nutrition: a systematic review.

By Richards DM, Deeks JJ, Sheldon TA, Shaffer JL.

No. 2

Diagnosis, management and screening of early localised prostate cancer.

A review by Selley S, Donovan J, Faulkner A, Coast J, Gillatt D.

No. 3

The diagnosis, management, treatment and costs of prostate cancer in England and Wales.

A review by Chamberlain J, Melia J, Moss S, Brown J.

No. 4

Screening for fragile X syndrome.

A review by Murray J, Cuckle H, Taylor G, Hewison J.

No. 5

A review of near patient testing in primary care.

By Hobbs FDR, Delaney BC, Fitzmaurice DA, Wilson S, Hyde CJ, Thorpe GH, *et al.*

No. 6

Systematic review of outpatient services for chronic pain control.

By McQuay HJ, Moore RA, Eccleston C, Morley S, de C Williams AC.

No. 7

Neonatal screening for inborn errors of metabolism: cost, yield and outcome.

A review by Pollitt RJ, Green A, McCabe CJ, Booth A, Cooper NJ, Leonard JV, *et al.*

No. 8

Preschool vision screening.

A review by Snowdon SK, Stewart-Brown SL.

No. 9

Implications of socio-cultural contexts for the ethics of clinical trials.

A review by Ashcroft RE, Chadwick DW, Clark SRL, Edwards RHT, Frith L, Hutton JL.

No. 10

A critical review of the role of neonatal hearing screening in the detection of congenital hearing impairment.

By Davis A, Bamford J, Wilson I, Ramkalawan T, Forshaw M, Wright S.

No. 11

Newborn screening for inborn errors of metabolism: a systematic review.

By Seymour CA, Thomason MJ, Chalmers RA, Addison GM, Bain MD, Cockburn F, *et al.*

No. 12

Routine preoperative testing: a systematic review of the evidence.

By Munro J, Booth A, Nicholl J.

No. 13

Systematic review of the effectiveness of laxatives in the elderly.

By Petticrew M, Watt I, Sheldon T.

No. 14

When and how to assess fast-changing technologies: a comparative study of medical applications of four generic technologies.

A review by Mowatt G, Bower DJ, Brebner JA, Cairns JA, Grant AM, McKee L.

Volume 2, 1998

No. 1

Antenatal screening for Down's syndrome.

A review by Wald NJ, Kennard A, Hackshaw A, McGuire A.

No. 2

Screening for ovarian cancer: a systematic review.

By Bell R, Petticrew M, Luengo S, Sheldon TA.

No. 3

Consensus development methods, and their use in clinical guideline development.

A review by Murphy MK, Black NA, Lamping DL, McKee CM, Sanderson CFB, Askham J, *et al.*

No. 4

A cost-utility analysis of interferon beta for multiple sclerosis.

By Parkin D, McNamee P, Jacoby A, Miller P, Thomas S, Bates D.

No. 5

Effectiveness and efficiency of methods of dialysis therapy for end-stage renal disease: systematic reviews.

By MacLeod A, Grant A, Donaldson C, Khan I, Campbell M, Daly C, *et al.*

No. 6

Effectiveness of hip prostheses in primary total hip replacement: a critical review of evidence and an economic model.

By Faulkner A, Kennedy LG, Baxter K, Donovan J, Wilkinson M, Bevan G.

No. 7

Antimicrobial prophylaxis in colorectal surgery: a systematic review of randomised controlled trials.

By Song F, Glenny AM.

No. 8

Bone marrow and peripheral blood stem cell transplantation for malignancy.

A review by Johnson PWM, Simnett SJ, Sweetenham JW, Morgan GJ, Stewart LA.

No. 9

Screening for speech and language delay: a systematic review of the literature.

By Law J, Boyle J, Harris F, Harkness A, Nye C.

No. 10

Resource allocation for chronic stable angina: a systematic review of effectiveness, costs and cost-effectiveness of alternative interventions.

By Sculpher MJ, Petticrew M, Kelland JL, Elliott RA, Holdright DR, Buxton MJ.

No. 11

Detection, adherence and control of hypertension for the prevention of stroke: a systematic review.

By Ebrahim S.

No. 12

Postoperative analgesia and vomiting, with special reference to day-case surgery: a systematic review.

By McQuay HJ, Moore RA.

No. 13

Choosing between randomised and nonrandomised studies: a systematic review.

By Britton A, McKee M, Black N, McPherson K, Sanderson C, Bain C.

No. 14

Evaluating patient-based outcome measures for use in clinical trials.

A review by Fitzpatrick R, Davey C, Buxton MJ, Jones DR.

No. 15

Ethical issues in the design and conduct of randomised controlled trials.

A review by Edwards SJL, Lilford RJ, Braunholtz DA, Jackson JC, Hewison J, Thornton J.

No. 16

Qualitative research methods in health technology assessment: a review of the literature.

By Murphy E, Dingwall R, Greatbatch D, Parker S, Watson P.

No. 17

The costs and benefits of paramedic skills in pre-hospital trauma care.

By Nicholl J, Hughes S, Dixon S, Turner J, Yates D.

No. 18

Systematic review of endoscopic ultrasound in gastro-oesophageal cancer.

By Harris KM, Kelly S, Berry E, Hutton J, Roderick P, Cullingworth J, *et al.*

No. 19

Systematic reviews of trials and other studies.

By Sutton AJ, Abrams KR, Jones DR, Sheldon TA, Song F.

No. 20

Primary total hip replacement surgery: a systematic review of outcomes and modelling of cost-effectiveness associated with different prostheses.

A review by Fitzpatrick R, Shortall E, Sculpher M, Murray D, Morris R, Lodge M, *et al.*

Volume 3, 1999

No. 1

Informed decision making: an annotated bibliography and systematic review.

By Bekker H, Thornton JG, Airey CM, Connelly JB, Hewison J, Robinson MB, *et al.*

No. 2

Handling uncertainty when performing economic evaluation of healthcare interventions.

A review by Briggs AH, Gray AM.

No. 3

The role of expectancies in the placebo effect and their use in the delivery of health care: a systematic review.

By Crow R, Gage H, Hampson S, Hart J, Kimber A, Thomas H.

No. 4

A randomised controlled trial of different approaches to universal antenatal HIV testing: uptake and acceptability. Annex: Antenatal HIV testing – assessment of a routine voluntary approach.

By Simpson WM, Johnstone FD, Boyd FM, Goldberg DJ, Hart GJ, Gormley SM, *et al.*

No. 5

Methods for evaluating area-wide and organisation-based interventions in health and health care: a systematic review.

By Ukoumunne OC, Gulliford MC, Chinn S, Sterne JAC, Burney PGJ.

No. 6

Assessing the costs of healthcare technologies in clinical trials.

A review by Johnston K, Buxton MJ, Jones DR, Fitzpatrick R.

No. 7

Cooperatives and their primary care emergency centres: organisation and impact.

By Hallam L, Henthorne K.

No. 8

Screening for cystic fibrosis.

A review by Murray J, Cuckle H, Taylor G, Littlewood J, Hewison J.

No. 9

A review of the use of health status measures in economic evaluation.

By Brazier J, Deverill M, Green C, Harper R, Booth A.

No. 10

Methods for the analysis of quality-of-life and survival data in health technology assessment.

A review by Billingham LJ, Abrams KR, Jones DR.

No. 11

Antenatal and neonatal haemoglobinopathy screening in the UK: review and economic analysis.

By Zeuner D, Ades AE, Karnon J, Brown J, Dezateux C, Anionwu EN.

No. 12

Assessing the quality of reports of randomised trials: implications for the conduct of meta-analyses.

A review by Moher D, Cook DJ, Jadad AR, Tugwell P, Moher M, Jones A, *et al.*

No. 13

'Early warning systems' for identifying new healthcare technologies.

By Robert G, Stevens A, Gabbay J.

No. 14

A systematic review of the role of human papillomavirus testing within a cervical screening programme.

By Cuzick J, Sasieni P, Davies P, Adams J, Normand C, Frater A, *et al.*

No. 15

Near patient testing in diabetes clinics: appraising the costs and outcomes.

By Grieve R, Beech R, Vincent J, Mazurkiewicz J.

No. 16

Positron emission tomography: establishing priorities for health technology assessment.

A review by Robert G, Milne R.

No. 17 (Pt 1)

The debridement of chronic wounds: a systematic review.

By Bradley M, Cullum N, Sheldon T.

No. 17 (Pt 2)

Systematic reviews of wound care management: (2) Dressings and topical agents used in the healing of chronic wounds.

By Bradley M, Cullum N, Nelson EA, Petticrew M, Sheldon T, Torgerson D.

No. 18

A systematic literature review of spiral and electron beam computed tomography: with particular reference to clinical applications in hepatic lesions, pulmonary embolus and coronary artery disease.

By Berry E, Kelly S, Hutton J, Harris KM, Roderick P, Boyce JC, *et al.*

No. 19

What role for statins? A review and economic model.

By Ebrahim S, Davey Smith G, McCabe C, Payne N, Pickin M, Sheldon TA, *et al.*

No. 20

Factors that limit the quality, number and progress of randomised controlled trials.

A review by Prescott RJ, Counsell CE, Gillespie WJ, Grant AM, Russell IT, Kiauka S, *et al.*

No. 21

Antimicrobial prophylaxis in total hip replacement: a systematic review.

By Glenny AM, Song F.

No. 22

Health promoting schools and health promotion in schools: two systematic reviews.

By Lister-Sharp D, Chapman S, Stewart-Brown S, Sowden A.

No. 23

Economic evaluation of a primary care-based education programme for patients with osteoarthritis of the knee.

A review by Lord J, Victor C, Littlejohns P, Ross FM, Axford JS.

Volume 4, 2000**No. 1**

The estimation of marginal time preference in a UK-wide sample (TEMPUS) project.

A review by Cairns JA, van der Pol MM.

No. 2

Geriatric rehabilitation following fractures in older people: a systematic review.

By Cameron I, Crotty M, Currie C, Finnegan T, Gillespie L, Gillespie W, *et al.*

No. 3

Screening for sickle cell disease and thalassaemia: a systematic review with supplementary research.

By Davies SC, Cronin E, Gill M, Greengross P, Hickman M, Normand C.

No. 4

Community provision of hearing aids and related audiology services.

A review by Reeves DJ, Alborz A, Hickson FS, Bamford JM.

No. 5

False-negative results in screening programmes: systematic review of impact and implications.

By Petticrew MP, Sowden AJ, Lister-Sharp D, Wright K.

No. 6

Costs and benefits of community postnatal support workers: a randomised controlled trial.

By Morrell CJ, Spiby H, Stewart P, Walters S, Morgan A.

No. 7

Implantable contraceptives (subdermal implants and hormonally impregnated intrauterine systems) versus other forms of reversible contraceptives: two systematic reviews to assess relative effectiveness, acceptability, tolerability and cost-effectiveness.

By French RS, Cowan FM, Mansour DJA, Morris S, Procter T, Hughes D, *et al.*

No. 8

An introduction to statistical methods for health technology assessment.

A review by White SJ, Ashby D, Brown PJ.

No. 9

Disease-modifying drugs for multiple sclerosis: a rapid and systematic review.

By Clegg A, Bryant J, Milne R.

No. 10

Publication and related biases.

A review by Song F, Eastwood AJ, Gilbody S, Duley L, Sutton AJ.

No. 11

Cost and outcome implications of the organisation of vascular services.

By Michaels J, Brazier J, Palfreyman S, Shackley P, Slack R.

No. 12

Monitoring blood glucose control in diabetes mellitus: a systematic review.

By Coster S, Gulliford MC, Seed PT, Powrie JK, Swaminathan R.

No. 13

The effectiveness of domiciliary health visiting: a systematic review of international studies and a selective review of the British literature.

By Elkan R, Kendrick D, Hewitt M, Robinson JJA, Tolley K, Blair M, *et al.*

No. 14

The determinants of screening uptake and interventions for increasing uptake: a systematic review.

By Jepson R, Clegg A, Forbes C, Lewis R, Sowden A, Kleijnen J.

No. 15

The effectiveness and cost-effectiveness of prophylactic removal of wisdom teeth.

A rapid review by Song F, O'Meara S, Wilson P, Golder S, Kleijnen J.

No. 16

Ultrasound screening in pregnancy: a systematic review of the clinical effectiveness, cost-effectiveness and women's views.

By Bricker L, Garcia J, Henderson J, Mugford M, Neilson J, Roberts T, *et al.*

No. 17

A rapid and systematic review of the effectiveness and cost-effectiveness of the taxanes used in the treatment of advanced breast and ovarian cancer.

By Lister-Sharp D, McDonagh MS, Khan KS, Kleijnen J.

No. 18

Liquid-based cytology in cervical screening: a rapid and systematic review.

By Payne N, Chilcott J, McGoogan E.

No. 19

Randomised controlled trial of non-directive counselling, cognitive-behaviour therapy and usual general practitioner care in the management of depression as well as mixed anxiety and depression in primary care.

By King M, Sibbald B, Ward E, Bower P, Lloyd M, Gabbay M, *et al.*

No. 20

Routine referral for radiography of patients presenting with low back pain: is patients' outcome influenced by GPs' referral for plain radiography?

By Kerry S, Hilton S, Patel S, Dundas D, Rink E, Lord J.

No. 21

Systematic reviews of wound care management: (3) antimicrobial agents for chronic wounds; (4) diabetic foot ulceration.

By O'Meara S, Cullum N, Majid M, Sheldon T.

No. 22

Using routine data to complement and enhance the results of randomised controlled trials.

By Lewsey JD, Leyland AH, Murray GD, Boddy FA.

No. 23

Coronary artery stents in the treatment of ischaemic heart disease: a rapid and systematic review.

By Meads C, Cummins C, Jolly K, Stevens A, Burls A, Hyde C.

No. 24

Outcome measures for adult critical care: a systematic review.

By Hayes JA, Black NA, Jenkinson C, Young JD, Rowan KM, Daly K, *et al.*

No. 25

A systematic review to evaluate the effectiveness of interventions to promote the initiation of breastfeeding.

By Fairbank L, O'Meara S, Renfrew MJ, Woolridge M, Sowden AJ, Lister-Sharp D.

No. 26

Implantable cardioverter defibrillators: arrhythmias. A rapid and systematic review.

By Parkes J, Bryant J, Milne R.

No. 27

Treatments for fatigue in multiple sclerosis: a rapid and systematic review.

By Brañas P, Jordan R, Fry-Smith A, Burls A, Hyde C.

No. 28

Early asthma prophylaxis, natural history, skeletal development and economy (EASE): a pilot randomised controlled trial.

By Baxter-Jones ADG, Helms PJ, Russell G, Grant A, Ross S, Cairns JA, *et al.*

No. 29

Screening for hypercholesterolaemia versus case finding for familial hypercholesterolaemia: a systematic review and cost-effectiveness analysis.

By Marks D, Wonderling D, Thorogood M, Lambert H, Humphries SE, Neil HAW.

No. 30

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of glycoprotein IIb/IIIa antagonists in the medical management of unstable angina.

By McDonagh MS, Bachmann LM, Golder S, Kleijnen J, ter Riet G.

No. 31

A randomised controlled trial of prehospital intravenous fluid replacement therapy in serious trauma.

By Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D.

No. 32

Intrathecal pumps for giving opioids in chronic pain: a systematic review.

By Williams JE, Louw G, Towler G.

No. 33

Combination therapy (interferon alfa and ribavirin) in the treatment of chronic hepatitis C: a rapid and systematic review.

By Shepherd J, Waugh N, Hewitson P.

No. 34

A systematic review of comparisons of effect sizes derived from randomised and non-randomised studies.

By MacLehose RR, Reeves BC, Harvey IM, Sheldon TA, Russell IT, Black AMS.

No. 35

Intravascular ultrasound-guided interventions in coronary artery disease: a systematic literature review, with decision-analytic modelling, of outcomes and cost-effectiveness.

By Berry E, Kelly S, Hutton J, Lindsay HSJ, Blaxill JM, Evans JA, *et al.*

No. 36

A randomised controlled trial to evaluate the effectiveness and cost-effectiveness of counselling patients with chronic depression.

By Simpson S, Corney R, Fitzgerald P, Beecham J.

No. 37

Systematic review of treatments for atopic eczema.

By Hoare C, Li Wan Po A, Williams H.

No. 38

Bayesian methods in health technology assessment: a review.

By Spiegelhalter DJ, Myles JP, Jones DR, Abrams KR.

No. 39

The management of dyspepsia: a systematic review.

By Delaney B, Moayyedi P, Deeks J, Innes M, Soo S, Barton P, *et al.*

No. 40

A systematic review of treatments for severe psoriasis.

By Griffiths CEM, Clark CM, Chalmers RJG, Li Wan Po A, Williams HC.

Volume 5, 2001

No. 1

Clinical and cost-effectiveness of donepezil, rivastigmine and galantamine for Alzheimer's disease: a rapid and systematic review.

By Clegg A, Bryant J, Nicholson T, McIntyre L, De Broe S, Gerard K, *et al.*

No. 2

The clinical effectiveness and cost-effectiveness of riluzole for motor neurone disease: a rapid and systematic review.

By Stewart A, Sandercock J, Bryan S, Hyde C, Barton PM, Fry-Smith A, *et al.*

No. 3

Equity and the economic evaluation of healthcare.

By Sassi F, Archard L, Le Grand J.

No. 4

Quality-of-life measures in chronic diseases of childhood.

By Eiser C, Morse R.

No. 5

Eliciting public preferences for healthcare: a systematic review of techniques.

By Ryan M, Scott DA, Reeves C, Bate A, van Teijlingen ER, Russell EM, *et al.*

No. 6

General health status measures for people with cognitive impairment: learning disability and acquired brain injury.

By Riemsma RP, Forbes CA, Glanville JM, Eastwood AJ, Kleijnen J.

No. 7

An assessment of screening strategies for fragile X syndrome in the UK.

By Pembrey ME, Barnicoat AJ, Carmichael B, Bobrow M, Turner G.

No. 8

Issues in methodological research: perspectives from researchers and commissioners.

By Lilford RJ, Richardson A, Stevens A, Fitzpatrick R, Edwards S, Rock F, *et al.*

No. 9

Systematic reviews of wound care management: (5) beds; (6) compression; (7) laser therapy, therapeutic ultrasound, electrotherapy and electromagnetic therapy.

By Cullum N, Nelson EA, Flemming K, Sheldon T.

No. 10

Effects of educational and psychosocial interventions for adolescents with diabetes mellitus: a systematic review.

By Hampson SE, Skinner TC, Hart J, Storey L, Gage H, Foxcroft D, *et al.*

No. 11

Effectiveness of autologous chondrocyte transplantation for hyaline cartilage defects in knees: a rapid and systematic review.

By Jobanputra P, Parry D, Fry-Smith A, Burls A.

No. 12

Statistical assessment of the learning curves of health technologies.

By Ramsay CR, Grant AM, Wallace SA, Garthwaite PH, Monk AF, Russell IT.

No. 13

The effectiveness and cost-effectiveness of temozolomide for the treatment of recurrent malignant glioma: a rapid and systematic review.

By Dinnes J, Cave C, Huang S, Major K, Milne R.

No. 14

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of debriding agents in treating surgical wounds healing by secondary intention.

By Lewis R, Whiting P, ter Riet G, O'Meara S, Glanville J.

No. 15

Home treatment for mental health problems: a systematic review.

By Burns T, Knapp M, Catty J, Healey A, Henderson J, Watt H, *et al.*

No. 16

How to develop cost-conscious guidelines.

By Eccles M, Mason J.

No. 17

The role of specialist nurses in multiple sclerosis: a rapid and systematic review.

By De Broe S, Christopher F, Waugh N.

No. 18

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of orlistat in the management of obesity.

By O'Meara S, Riemsma R, Shirran L, Mather L, ter Riet G.

No. 19

The clinical effectiveness and cost-effectiveness of pioglitazone for type 2 diabetes mellitus: a rapid and systematic review.

By Chilcott J, Wight J, Lloyd Jones M, Tappenden P.

No. 20

Extended scope of nursing practice: a multicentre randomised controlled trial of appropriately trained nurses and preregistration house officers in preoperative assessment in elective general surgery.

By Kinley H, Czoski-Murray C, George S, McCabe C, Primrose J, Reilly C, *et al.*

No. 21

Systematic reviews of the effectiveness of day care for people with severe mental disorders: (1) Acute day hospital versus admission; (2) Vocational rehabilitation; (3) Day hospital versus outpatient care.

By Marshall M, Crowther R, Almaraz-Serrano A, Creed F, Sledge W, Kluiters H, *et al.*

No. 22

The measurement and monitoring of surgical adverse events.

By Bruce J, Russell EM, Mollison J, Krukowski ZH.

No. 23

Action research: a systematic review and guidance for assessment.

By Waterman H, Tillen D, Dickson R, de Koning K.

No. 24

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of gemcitabine for the treatment of pancreatic cancer.

By Ward S, Morris E, Bansback N, Calvert N, Crellin A, Forman D, *et al.*

No. 25

A rapid and systematic review of the evidence for the clinical effectiveness and cost-effectiveness of irinotecan, oxaliplatin and raltitrexed for the treatment of advanced colorectal cancer.

By Lloyd Jones M, Hummel S, Bansback N, Orr B, Seymour M.

No. 26

Comparison of the effectiveness of inhaler devices in asthma and chronic obstructive airways disease: a systematic review of the literature.

By Brocklebank D, Ram F, Wright J, Barry P, Cates C, Davies L, *et al.*

No. 27

The cost-effectiveness of magnetic resonance imaging for investigation of the knee joint.

By Bryan S, Weatherburn G, Bungay H, Hatrick C, Salas C, Parry D, *et al.*

No. 28

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of topotecan for ovarian cancer.

By Forbes C, Shirran L, Bagnall A-M, Duffy S, ter Riet G.

No. 29

Superseded by a report published in a later volume.

No. 30

The role of radiography in primary care patients with low back pain of at least 6 weeks duration: a randomised (unblinded) controlled trial.

By Kendrick D, Fielding K, Bentley E, Miller P, Kerslake R, Pringle M.

No. 31

Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients.

By McColl E, Jacoby A, Thomas L, Soutter J, Bamford C, Steen N, *et al.*

No. 32

A rapid and systematic review of the clinical effectiveness and cost-effectiveness of paclitaxel, docetaxel, gemcitabine and vinorelbine in non-small-cell lung cancer.

By Clegg A, Scott DA, Sidhu M, Hewitson P, Waugh N.

No. 33

Subgroup analyses in randomised controlled trials: quantifying the risks of false-positives and false-negatives.

By Brookes ST, Whitley E, Peters TJ, Mulheran PA, Egger M, Davey Smith G.

No. 34

Depot antipsychotic medication in the treatment of patients with schizophrenia: (1) Meta-review; (2) Patient and nurse attitudes.

By David AS, Adams C.

No. 35

A systematic review of controlled trials of the effectiveness and cost-effectiveness of brief psychological treatments for depression.

By Churchill R, Hunot V, Corney R, Knapp M, McGuire H, Tylee A, *et al.*

No. 36

Cost analysis of child health surveillance.

By Sanderson D, Wright D, Acton C, Duree D.

Volume 6, 2002**No. 1**

A study of the methods used to select review criteria for clinical audit.

By Hearnshaw H, Harker R, Cheater F, Baker R, Grimshaw G.

No. 2

Fludarabine as second-line therapy for B cell chronic lymphocytic leukaemia: a technology assessment.

By Hyde C, Wake B, Bryan S, Barton P, Fry-Smith A, Davenport C, *et al.*

No. 3

Rituximab as third-line treatment for refractory or recurrent Stage III or IV follicular non-Hodgkin's lymphoma: a systematic review and economic evaluation.

By Wake B, Hyde C, Bryan S, Barton P, Song F, Fry-Smith A, *et al.*

No. 4

A systematic review of discharge arrangements for older people.

By Parker SG, Peet SM, McPherson A, Cannaby AM, Baker R, Wilson A, *et al.*

No. 5

The clinical effectiveness and cost-effectiveness of inhaler devices used in the routine management of chronic asthma in older children: a systematic review and economic evaluation.

By Peters J, Stevenson M, Beverley C, Lim J, Smith S.

No. 6

The clinical effectiveness and cost-effectiveness of sibutramine in the management of obesity: a technology assessment.

By O'Meara S, Riemsma R, Shirran L, Mather L, ter Riet G.

No. 7

The cost-effectiveness of magnetic resonance angiography for carotid artery stenosis and peripheral vascular disease: a systematic review.

By Berry E, Kelly S, Westwood ME, Davies LM, Gough MJ, Bamford JM, *et al.*

No. 8

Promoting physical activity in South Asian Muslim women through 'exercise on prescription'.

By Carroll B, Ali N, Azam N.

No. 9

Zanamivir for the treatment of influenza in adults: a systematic review and economic evaluation.

By Burls A, Clark W, Stewart T, Preston C, Bryan S, Jefferson T, *et al.*

No. 10

A review of the natural history and epidemiology of multiple sclerosis: implications for resource allocation and health economic models.

By Richards RG, Sampson FC, Beard SM, Tappenden P.

No. 11

Screening for gestational diabetes: a systematic review and economic evaluation.

By Scott DA, Loveman E, McIntyre L, Waugh N.

No. 12

The clinical effectiveness and cost-effectiveness of surgery for people with morbid obesity: a systematic review and economic evaluation.

By Clegg AJ, Colquitt J, Sidhu MK, Royle P, Loveman E, Walker A.

No. 13

The clinical effectiveness of trastuzumab for breast cancer: a systematic review.

By Lewis R, Bagnall A-M, Forbes C, Shirran E, Duffy S, Kleijnen J, *et al.*

No. 14

The clinical effectiveness and cost-effectiveness of vinorelbine for breast cancer: a systematic review and economic evaluation.

By Lewis R, Bagnall A-M, King S, Woolcott N, Forbes C, Shirran L, *et al.*

No. 15

A systematic review of the effectiveness and cost-effectiveness of metal-on-metal hip resurfacing arthroplasty for treatment of hip disease.

By Vale L, Wyness L, McCormack K, McKenzie L, Brazzelli M, Stearns SC.

No. 16

The clinical effectiveness and cost-effectiveness of bupropion and nicotine replacement therapy for smoking cessation: a systematic review and economic evaluation.

By Woolcott NF, Jones L, Forbes CA, Mather LC, Sowden AJ, Song FJ, *et al.*

No. 17

A systematic review of effectiveness and economic evaluation of new drug treatments for juvenile idiopathic arthritis: etanercept.

By Cummins C, Connock M, Fry-Smith A, Burls A.

No. 18

Clinical effectiveness and cost-effectiveness of growth hormone in children: a systematic review and economic evaluation.

By Bryant J, Cave C, Mihaylova B, Chase D, McIntyre L, Gerard K, *et al.*

No. 19

Clinical effectiveness and cost-effectiveness of growth hormone in adults in relation to impact on quality of life: a systematic review and economic evaluation.

By Bryant J, Loveman E, Chase D, Mihaylova B, Cave C, Gerard K, *et al.*

No. 20

Clinical medication review by a pharmacist of patients on repeat prescriptions in general practice: a randomised controlled trial.

By Zermansky AG, Petty DR, Raynor DK, Lowe CJ, Freemantle N, Vail A.

No. 21

The effectiveness of infliximab and etanercept for the treatment of rheumatoid arthritis: a systematic review and economic evaluation.

By Jobanputra P, Barton P, Bryan S, Burls A.

No. 22

A systematic review and economic evaluation of computerised cognitive behaviour therapy for depression and anxiety.

By Kaltenthaler E, Shackley P, Stevens K, Beverley C, Parry G, Chilcott J.

No. 23

A systematic review and economic evaluation of pegylated liposomal doxorubicin hydrochloride for ovarian cancer.

By Forbes C, Wilby J, Richardson G, Sculpher M, Mather L, Reimsma R.

No. 24

A systematic review of the effectiveness of interventions based on a stages-of-change approach to promote individual behaviour change.

By Riemsma RP, Pattenden J, Bridle C, Sowden AJ, Mather L, Watt IS, *et al.*

No. 25

A systematic review update of the clinical effectiveness and cost-effectiveness of glycoprotein IIb/IIIa antagonists.

By Robinson M, Ginnelly L, Sculpher M, Jones L, Riemsma R, Palmer S, *et al.*

No. 26

A systematic review of the effectiveness, cost-effectiveness and barriers to implementation of thrombolytic and neuroprotective therapy for acute ischaemic stroke in the NHS.

By Sandercock P, Berge E, Dennis M, Forbes J, Hand P, Kwan J, *et al.*

No. 27

A randomised controlled crossover trial of nurse practitioner versus doctor-led outpatient care in a bronchiectasis clinic.

By Caine N, Sharples LD, Hollingworth W, French J, Keogan M, Exley A, *et al.*

No. 28

Clinical effectiveness and cost – consequences of selective serotonin reuptake inhibitors in the treatment of sex offenders.

By Adi Y, Ashcroft D, Browne K, Beech A, Fry-Smith A, Hyde C.

No. 29

Treatment of established osteoporosis: a systematic review and cost-utility analysis.

By Kanis JA, Brazier JE, Stevenson M, Calvert NW, Lloyd Jones M.

No. 30

Which anaesthetic agents are cost-effective in day surgery? Literature review, national survey of practice and randomised controlled trial.

By Elliott RA Payne K, Moore JK, Davies LM, Harper NJN, St Leger AS, *et al.*

No. 31

Screening for hepatitis C among injecting drug users and in genitourinary medicine clinics: systematic reviews of effectiveness, modelling study and national survey of current practice.

By Stein K, Dalziel K, Walker A, McIntyre L, Jenkins B, Horne J, *et al.*

No. 32

The measurement of satisfaction with healthcare: implications for practice from a systematic review of the literature.

By Crow R, Gage H, Hampson S, Hart J, Kimber A, Storey L, *et al.*

No. 33

The effectiveness and cost-effectiveness of imatinib in chronic myeloid leukaemia: a systematic review.

By Garside R, Round A, Dalziel K, Stein K, Royle R.

No. 34

A comparative study of hypertonic saline, daily and alternate-day rhDNase in children with cystic fibrosis.

By Suri R, Wallis C, Bush A, Thompson S, Normand C, Flather M, *et al.*

No. 35

A systematic review of the costs and effectiveness of different models of paediatric home care.

By Parker G, Bhakta P, Lovett CA, Paisley S, Olsen R, Turner D, *et al.*

Volume 7, 2003

No. 1

How important are comprehensive literature searches and the assessment of trial quality in systematic reviews? Empirical study.

By Egger M, Jüni P, Bartlett C, Holenstein F, Sterne J.

No. 2

Systematic review of the effectiveness and cost-effectiveness, and economic evaluation, of home versus hospital or satellite unit haemodialysis for people with end-stage renal failure.

By Mowatt G, Vale L, Perez J, Wyness L, Fraser C, MacLeod A, *et al.*

No. 3

Systematic review and economic evaluation of the effectiveness of infliximab for the treatment of Crohn's disease.

By Clark W, Raftery J, Barton P, Song F, Fry-Smith A, Burls A.

No. 4

A review of the clinical effectiveness and cost-effectiveness of routine anti-D prophylaxis for pregnant women who are rhesus negative.

By Chilcott J, Lloyd Jones M, Wight J, Forman K, Wray J, Beverley C, *et al.*

No. 5

Systematic review and evaluation of the use of tumour markers in paediatric oncology: Ewing's sarcoma and neuroblastoma.

By Riley RD, Burchill SA, Abrams KR, Heney D, Lambert PC, Jones DR, *et al.*

No. 6

The cost-effectiveness of screening for *Helicobacter pylori* to reduce mortality and morbidity from gastric cancer and peptic ulcer disease: a discrete-event simulation model.

By Roderick P, Davies R, Raftery J, Crabbe D, Pearce R, Bhandari P, *et al.*

No. 7

The clinical effectiveness and cost-effectiveness of routine dental checks: a systematic review and economic evaluation.

By Davenport C, Elley K, Salas C, Taylor-Weetman CL, Fry-Smith A, Bryan S, *et al.*

No. 8

A multicentre randomised controlled trial assessing the costs and benefits of using structured information and analysis of women's preferences in the management of menorrhagia.

By Kennedy ADM, Sculpher MJ, Coulter A, Dwyer N, Rees M, Horsley S, *et al.*

No. 9

Clinical effectiveness and cost-utility of photodynamic therapy for wet age-related macular degeneration: a systematic review and economic evaluation.

By Meads C, Salas C, Roberts T, Moore D, Fry-Smith A, Hyde C.

No. 10

Evaluation of molecular tests for prenatal diagnosis of chromosome abnormalities.

By Grimshaw GM, Szczepura A, Hultén M, MacDonald F, Nevin NC, Sutton F, *et al.*

No. 11

First and second trimester antenatal screening for Down's syndrome: the results of the Serum, Urine and Ultrasound Screening Study (SURUSS).

By Wald NJ, Rodeck C, Hackshaw AK, Walters J, Chitty L, Mackinson AM.

No. 12

The effectiveness and cost-effectiveness of ultrasound locating devices for central venous access: a systematic review and economic evaluation.

By Calvert N, Hind D, McWilliams RG, Thomas SM, Beverley C, Davidson A.

No. 13

A systematic review of atypical antipsychotics in schizophrenia.

By Bagnall A-M, Jones L, Lewis R, Ginnelly L, Glanville J, Torgerson D, *et al.*

No. 14

Prostate Testing for Cancer and Treatment (ProtecT) feasibility study.

By Donovan J, Hamdy F, Neal D, Peters T, Oliver S, Brindle L, *et al.*

No. 15

Early thrombolysis for the treatment of acute myocardial infarction: a systematic review and economic evaluation.

By Boland A, Dundar Y, Bagust A, Haycox A, Hill R, Mujica Mota R, *et al.*

No. 16

Screening for fragile X syndrome: a literature review and modelling.

By Song FJ, Barton P, Sleightholme V, Yao GL, Fry-Smith A.

No. 17

Systematic review of endoscopic sinus surgery for nasal polyps.

By Dalziel K, Stein K, Round A, Garside R, Royle P.

No. 18

Towards efficient guidelines: how to monitor guideline use in primary care.

By Hutchinson A, McIntosh A, Cox S, Gilbert C.

No. 19

Effectiveness and cost-effectiveness of acute hospital-based spinal cord injuries services: systematic review.

By Bagnall A-M, Jones L, Richardson G, Duffy S, Riemsma R.

No. 20

Prioritisation of health technology assessment. The PATHS model: methods and case studies.

By Townsend J, Buxton M, Harper G.

No. 21

Systematic review of the clinical effectiveness and cost-effectiveness of tension-free vaginal tape for treatment of urinary stress incontinence.

By Cody J, Wyness L, Wallace S, Glazener C, Kilonzo M, Stearns S, *et al.*

No. 22

The clinical and cost-effectiveness of patient education models for diabetes: a systematic review and economic evaluation.

By Loveman E, Cave C, Green C, Royle P, Dunn N, Waugh N.

No. 23

The role of modelling in prioritising and planning clinical trials.

By Chilcott J, Brennan A, Booth A, Karnon J, Tappenden P.

No. 24

Cost-benefit evaluation of routine influenza immunisation in people 65-74 years of age.

By Allsup S, Gosney M, Haycox A, Regan M.

No. 25

The clinical and cost-effectiveness of pulsatile machine perfusion versus cold storage of kidneys for transplantation retrieved from heart-beating and non-heart-beating donors.

By Wight J, Chilcott J, Holmes M, Brewer N.

No. 26

Can randomised trials rely on existing electronic data? A feasibility study to explore the value of routine data in health technology assessment.

By Williams JG, Cheung WY, Cohen DR, Hutchings HA, Longo MF, Russell IT.

No. 27

Evaluating non-randomised intervention studies.

By Deeks JJ, Dinnes J, D'Amico R, Sowden AJ, Sakarovich C, Song F, *et al.*

No. 28

A randomised controlled trial to assess the impact of a package comprising a patient-orientated, evidence-based self-help guidebook and patient-centred consultations on disease management and satisfaction in inflammatory bowel disease.

By Kennedy A, Nelson E, Reeves D, Richardson G, Roberts C, Robinson A, *et al.*

No. 29

The effectiveness of diagnostic tests for the assessment of shoulder pain due to soft tissue disorders: a systematic review.

By Dinnes J, Loveman E, McIntyre L, Waugh N.

No. 30

The value of digital imaging in diabetic retinopathy.

By Sharp PF, Olson J, Strachan F, Hipwell J, Ludbrook A, O'Donnell M, *et al.*

No. 31

Lowering blood pressure to prevent myocardial infarction and stroke: a new preventive strategy.

By Law M, Wald N, Morris J.

No. 32

Clinical and cost-effectiveness of capecitabine and tegafur with uracil for the treatment of metastatic colorectal cancer: systematic review and economic evaluation.

By Ward S, Kaltenthaler E, Cowan J, Brewer N.

No. 33

Clinical and cost-effectiveness of new and emerging technologies for early localised prostate cancer: a systematic review.

By Hummel S, Paisley S, Morgan A, Currie E, Brewer N.

No. 34

Literature searching for clinical and cost-effectiveness studies used in health technology assessment reports carried out for the National Institute for Clinical Excellence appraisal system.

By Royle P, Waugh N.

No. 35

Systematic review and economic decision modelling for the prevention and treatment of influenza A and B.

By Turner D, Wailoo A, Nicholson K, Cooper N, Sutton A, Abrams K.

No. 36

A randomised controlled trial to evaluate the clinical and cost-effectiveness of Hickman line insertions in adult cancer patients by nurses.

By Boland A, Haycox A, Bagust A, Fitzsimmons L.

No. 37

Redesigning postnatal care: a randomised controlled trial of protocol-based midwifery-led care focused on individual women's physical and psychological health needs.

By MacArthur C, Winter HR, Bick DE, Lilford RJ, Lancashire RJ, Knowles H, *et al.*

No. 38

Estimating implied rates of discount in healthcare decision-making.

By West RR, McNabb R, Thompson AGH, Sheldon TA, Grimley Evans J.

No. 39

Systematic review of isolation policies in the hospital management of methicillin-resistant *Staphylococcus aureus*: a review of the literature with epidemiological and economic modelling.

By Cooper BS, Stone SP, Kibbler CC, Cookson BD, Roberts JA, Medley GF, *et al.*

No. 40

Treatments for spasticity and pain in multiple sclerosis: a systematic review.

By Beard S, Hunn A, Wight J.

No. 41

The inclusion of reports of randomised trials published in languages other than English in systematic reviews.

By Moher D, Pham B, Lawson ML, Klassen TP.

No. 42

The impact of screening on future health-promoting behaviours and health beliefs: a systematic review.

By Bankhead CR, Brett J, Bukach C, Webster P, Stewart-Brown S, Munafo M, *et al.*

Volume 8, 2004

No. 1

What is the best imaging strategy for acute stroke?

By Wardlaw JM, Keir SL, Seymour J, Lewis S, Sandercock PAG, Dennis MS, *et al.*

No. 2

Systematic review and modelling of the investigation of acute and chronic chest pain presenting in primary care.

By Mant J, McManus RJ, Oakes RAL, Delaney BC, Barton PM, Deeks JJ, *et al.*

No. 3

The effectiveness and cost-effectiveness of microwave and thermal balloon endometrial ablation for heavy menstrual bleeding: a systematic review and economic modelling.

By Garside R, Stein K, Wyatt K, Round A, Price A.

No. 4

A systematic review of the role of bisphosphonates in metastatic disease.

By Ross JR, Saunders Y, Edmonds PM, Patel S, Wonderling D, Normand C, *et al.*

No. 5

Systematic review of the clinical effectiveness and cost-effectiveness of capecitabine (Xeloda®) for locally advanced and/or metastatic breast cancer.

By Jones L, Hawkins N, Westwood M, Wright K, Richardson G, Riemsma R.

No. 6

Effectiveness and efficiency of guideline dissemination and implementation strategies.

By Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Ramsay CR, Vale L, *et al.*

No. 7

Clinical effectiveness and costs of the Sugarbaker procedure for the treatment of pseudomyxoma peritonei.

By Bryant J, Clegg AJ, Sidhu MK, Brodin H, Royle P, Davidson P.

No. 8

Psychological treatment for insomnia in the regulation of long-term hypnotic drug use.

By Morgan K, Dixon S, Mathers N, Thompson J, Tomeny M.

No. 9

Improving the evaluation of therapeutic interventions in multiple sclerosis: development of a patient-based measure of outcome.

By Hobart JC, Riazi A, Lamping DL, Fitzpatrick R, Thompson AJ.

No. 10

A systematic review and economic evaluation of magnetic resonance cholangiopancreatography compared with diagnostic endoscopic retrograde cholangiopancreatography.

By Kaltenthaler E, Bravo Vergel Y, Chilcott J, Thomas S, Blakeborough T, Walters SJ, *et al.*

No. 11

The use of modelling to evaluate new drugs for patients with a chronic condition: the case of antibodies against tumour necrosis factor in rheumatoid arthritis.

By Barton P, Jobanputra P, Wilson J, Bryan S, Burls A.

No. 12

Clinical effectiveness and cost-effectiveness of neonatal screening for inborn errors of metabolism using tandem mass spectrometry: a systematic review.

By Pandor A, Eastham J, Beverley C, Chilcott J, Paisley S.

No. 13

Clinical effectiveness and cost-effectiveness of pioglitazone and rosiglitazone in the treatment of type 2 diabetes: a systematic review and economic evaluation.

By Czoski-Murray C, Warren E, Chilcott J, Beverley C, Psyllaki MA, Cowan J.

No. 14

Routine examination of the newborn: the EMREN study. Evaluation of an extension of the midwife role including a randomised controlled trial of appropriately trained midwives and paediatric senior house officers.

By Townsend J, Wolke D, Hayes J, Davé S, Rogers C, Bloomfield L, *et al.*

No. 15

Involving consumers in research and development agenda setting for the NHS: developing an evidence-based approach.

By Oliver S, Clarke-Jones L, Rees R, Milne R, Buchanan P, Gabbay J, *et al.*

No. 16

A multi-centre randomised controlled trial of minimally invasive direct coronary bypass grafting versus percutaneous transluminal coronary angioplasty with stenting for proximal stenosis of the left anterior descending coronary artery.

By Reeves BC, Angelini GD, Bryan AJ, Taylor FC, Cripps T, Spyt TJ, *et al.*

No. 17

Does early magnetic resonance imaging influence management or improve outcome in patients referred to secondary care with low back pain? A pragmatic randomised controlled trial.

By Gilbert FJ, Grant AM, Gillan MGC, Vale L, Scott NW, Campbell MK, *et al.*

No. 18

The clinical and cost-effectiveness of anakinra for the treatment of rheumatoid arthritis in adults: a systematic review and economic analysis.

By Clark W, Jobanputra P, Barton P, Burls A.

No. 19

A rapid and systematic review and economic evaluation of the clinical and cost-effectiveness of newer drugs for treatment of mania associated with bipolar affective disorder.

By Bridle C, Palmer S, Bagnall A-M, Darba J, Duffy S, Sculpher M, *et al.*

No. 20

Liquid-based cytology in cervical screening: an updated rapid and systematic review and economic analysis.

By Karnon J, Peters J, Platt J, Chilcott J, McGoogan E, Brewer N.

No. 21

Systematic review of the long-term effects and economic consequences of treatments for obesity and implications for health improvement.

By Avenell A, Broom J, Brown TJ, Poobalan A, Aucott L, Stearns SC, *et al.*

No. 22

Autoantibody testing in children with newly diagnosed type 1 diabetes mellitus.

By Dretzke J, Cummins C, Sandercock J, Fry-Smith A, Barrett T, Burls A.

No. 23

Clinical effectiveness and cost-effectiveness of prehospital intravenous fluids in trauma patients.

By Dretzke J, Sandercock J, Bayliss S, Burls A.

No. 24

Newer hypnotic drugs for the short-term management of insomnia: a systematic review and economic evaluation.

By Dündar Y, Boland A, Strobl J, Dodd S, Haycox A, Bagust A, *et al.*

No. 25

Development and validation of methods for assessing the quality of diagnostic accuracy studies.

By Whiting P, Rutjes AWS, Dinnes J, Reitsma JB, Bossuyt PMM, Kleijnen J.

No. 26

EVALUATE hysterectomy trial: a multicentre randomised trial comparing abdominal, vaginal and laparoscopic methods of hysterectomy.

By Garry R, Fountain J, Brown J, Manca A, Mason S, Sculpher M, *et al.*

No. 27

Methods for expected value of information analysis in complex health economic models: developments on the health economics of interferon- β and glatiramer acetate for multiple sclerosis.

By Tappenden P, Chilcott JB, Eggington S, Oakley J, McCabe C.

No. 28

Effectiveness and cost-effectiveness of imatinib for first-line treatment of chronic myeloid leukaemia in chronic phase: a systematic review and economic analysis.

By Dalziel K, Round A, Stein K, Garside R, Price A.

No. 29

VenUS I: a randomised controlled trial of two types of bandage for treating venous leg ulcers.

By Iglesias C, Nelson EA, Cullum NA, Torgerson DJ, on behalf of the VenUS Team.

No. 30

Systematic review of the effectiveness and cost-effectiveness, and economic evaluation, of myocardial perfusion scintigraphy for the diagnosis and management of angina and myocardial infarction.

By Mowatt G, Vale L, Brazzelli M, Hernandez R, Murray A, Scott N, *et al.*

No. 31

A pilot study on the use of decision theory and value of information analysis as part of the NHS Health Technology Assessment programme.

By Claxton K, Ginnelly L, Sculpher M, Philips Z, Palmer S.

No. 32

The Social Support and Family Health Study: a randomised controlled trial and economic evaluation of two alternative forms of postnatal support for mothers living in disadvantaged inner-city areas.

By Wiggins M, Oakley A, Roberts I, Turner H, Rajan L, Austerberry H, *et al.*

No. 33

Psychosocial aspects of genetic screening of pregnant women and newborns: a systematic review.

By Green JM, Hewison J, Bekker HL, Bryant, Cuckle HS.

No. 34

Evaluation of abnormal uterine bleeding: comparison of three outpatient procedures within cohorts defined by age and menopausal status.

By Critchley HOD, Warner P, Lee AJ, Brechin S, Guise J, Graham B.

No. 35

Coronary artery stents: a rapid systematic review and economic evaluation.

By Hill R, Bagust A, Bakhai A, Dickson R, Dündar Y, Haycox A, *et al.*

No. 36

Review of guidelines for good practice in decision-analytic modelling in health technology assessment.

By Philips Z, Ginnelly L, Sculpher M, Claxton K, Golder S, Riemsma R, *et al.*

No. 37

Rituximab (MabThera®) for aggressive non-Hodgkin's lymphoma: systematic review and economic evaluation.

By Knight C, Hind D, Brewer N, Abbott V.

No. 38

Clinical effectiveness and cost-effectiveness of clopidogrel and modified-release dipyridamole in the secondary prevention of occlusive vascular events: a systematic review and economic evaluation.

By Jones L, Griffin S, Palmer S, Main C, Orton V, Sculpher M, *et al.*

No. 39

Pegylated interferon α -2a and -2b in combination with ribavirin in the treatment of chronic hepatitis C: a systematic review and economic evaluation.

By Shepherd J, Brodin H, Cave C, Waugh N, Price A, Gabbay J.

No. 40

Clopidogrel used in combination with aspirin compared with aspirin alone in the treatment of non-ST-segment-elevation acute coronary syndromes: a systematic review and economic evaluation.

By Main C, Palmer S, Griffin S, Jones L, Orton V, Sculpher M, *et al.*

No. 41

Provision, uptake and cost of cardiac rehabilitation programmes: improving services to under-represented groups.

By Beswick AD, Rees K, Griebisch I, Taylor FC, Burke M, West RR, *et al.*

No. 42

Involving South Asian patients in clinical trials.

By Hussain-Gambles M, Leese B, Atkin K, Brown J, Mason S, Tovey P.

No. 43

Clinical and cost-effectiveness of continuous subcutaneous insulin infusion for diabetes.

By Colquitt JL, Green C, Sidhu MK, Hartwell D, Waugh N.

No. 44

Identification and assessment of ongoing trials in health technology assessment reviews.

By Song FJ, Fry-Smith A, Davenport C, Bayliss S, Adi Y, Wilson JS, *et al.*

No. 45

Systematic review and economic evaluation of a long-acting insulin analogue, insulin glargine

By Warren E, Weatherley-Jones E, Chilcott J, Beverley C.

No. 46

Supplementation of a home-based exercise programme with a class-based programme for people with osteoarthritis of the knees: a randomised controlled trial and health economic analysis.

By McCarthy CJ, Mills PM, Pullen R, Richardson G, Hawkins N, Roberts CR, *et al.*

No. 47

Clinical and cost-effectiveness of once-daily versus more frequent use of same potency topical corticosteroids for atopic eczema: a systematic review and economic evaluation.

By Green C, Colquitt JL, Kirby J, Davidson P, Payne E.

No. 48

Acupuncture of chronic headache disorders in primary care: randomised controlled trial and economic analysis.

By Vickers AJ, Rees RW, Zollman CE, McCarney R, Smith CM, Ellis N, *et al.*

No. 49

Generalisability in economic evaluation studies in healthcare: a review and case studies.

By Sculpher MJ, Pang FS, Manca A, Drummond MF, Golder S, Urdahl H, *et al.*

No. 50

Virtual outreach: a randomised controlled trial and economic evaluation of joint teleconferenced medical consultations.

By Wallace P, Barber J, Clayton W, Currell R, Fleming K, Garner P, *et al.*

Volume 9, 2005

No. 1

Randomised controlled multiple treatment comparison to provide a cost-effectiveness rationale for the selection of antimicrobial therapy in acne.

By Ozolins M, Eady EA, Avery A, Cunliffe WJ, O'Neill C, Simpson NB, *et al.*

No. 2

Do the findings of case series studies vary significantly according to methodological characteristics?

By Dalziel K, Round A, Stein K, Garside R, Castelnovo E, Payne L.

No. 3

Improving the referral process for familial breast cancer genetic counselling: findings of three randomised controlled trials of two interventions.

By Wilson BJ, Torrance N, Mollison J, Wordsworth S, Gray JR, Haites NE, *et al.*

No. 4

Randomised evaluation of alternative electrosurgical modalities to treat bladder outflow obstruction in men with benign prostatic hyperplasia.

By Fowler C, McAllister W, Plail R, Karim O, Yang Q.

No. 5

A pragmatic randomised controlled trial of the cost-effectiveness of palliative therapies for patients with inoperable oesophageal cancer.

By Shenfine J, McNamee P, Steen N, Bond J, Griffin SM.

No. 6

Impact of computer-aided detection prompts on the sensitivity and specificity of screening mammography.

By Taylor P, Champness J, Given-Wilson R, Johnston K, Potts H.

No. 7

Issues in data monitoring and interim analysis of trials.

By Grant AM, Altman DG, Babiker AB, Campbell MK, Clemens FJ, Darbyshire JH, *et al.*

No. 8

Lay public's understanding of equipoise and randomisation in randomised controlled trials.

By Robinson EJ, Kerr CEP, Stevens AJ, Lilford RJ, Braunholtz DA, Edwards SJ, *et al.*

No. 9

Clinical and cost-effectiveness of electroconvulsive therapy for depressive illness, schizophrenia, catatonia and mania: systematic reviews and economic modelling studies.

By Greenhalgh J, Knight C, Hind D, Beverley C, Walters S.

No. 10

Measurement of health-related quality of life for people with dementia: development of a new instrument (DEMQOL) and an evaluation of current methodology.

By Smith SC, Lamping DL, Banerjee S, Harwood R, Foley B, Smith P, *et al.*

No. 11

Clinical effectiveness and cost-effectiveness of drotrecogin alfa (activated) (Xigris®) for the treatment of severe sepsis in adults: a systematic review and economic evaluation.

By Green C, Dinnes J, Takeda A, Shepherd J, Hartwell D, Cave C, *et al.*

No. 12

A methodological review of how heterogeneity has been examined in systematic reviews of diagnostic test accuracy.

By Dinnes J, Deeks J, Kirby J, Roderick P.

No. 13

Cervical screening programmes: can automation help? Evidence from systematic reviews, an economic analysis and a simulation modelling exercise applied to the UK.

By Willis BH, Barton P, Pearmain P, Bryan S, Hyde C.

No. 14

Laparoscopic surgery for inguinal hernia repair: systematic review of effectiveness and economic evaluation.

By McCormack K, Wake B, Perez J, Fraser C, Cook J, McIntosh E, *et al.*

No. 15

Clinical effectiveness, tolerability and cost-effectiveness of newer drugs for epilepsy in adults: a systematic review and economic evaluation.

By Wilby J, Kainth A, Hawkins N, Epstein D, McIntosh H, McDaid C, *et al.*

No. 16

A randomised controlled trial to compare the cost-effectiveness of tricyclic antidepressants, selective serotonin reuptake inhibitors and lofepramine.

By Peveler R, Kendrick T, Buxton M, Longworth L, Baldwin D, Moore M, *et al.*

No. 17

Clinical effectiveness and cost-effectiveness of immediate angioplasty for acute myocardial infarction: systematic review and economic evaluation.

By Hartwell D, Colquitt J, Loveman E, Clegg AJ, Brodin H, Waugh N, *et al.*

No. 18

A randomised controlled comparison of alternative strategies in stroke care.

By Kalra L, Evans A, Perez I, Knapp M, Swift C, Donaldson N.

No. 19

The investigation and analysis of critical incidents and adverse events in healthcare.

By Woloshynowych M, Rogers S, Taylor-Adams S, Vincent C.

No. 20

Potential use of routine databases in health technology assessment.

By Raftery J, Roderick P, Stevens A.

No. 21

Clinical and cost-effectiveness of newer immunosuppressive regimens in renal transplantation: a systematic review and modelling study.

By Woodroffe R, Yao GL, Meads C, Bayliss S, Ready A, Raftery J, *et al.*

No. 22

A systematic review and economic evaluation of alendronate, etidronate, risedronate, raloxifene and teriparatide for the prevention and treatment of postmenopausal osteoporosis.

By Stevenson M, Lloyd Jones M, De Nigris E, Brewer N, Davis S, Oakley J.

No. 23

A systematic review to examine the impact of psycho-educational interventions on health outcomes and costs in adults and children with difficult asthma.

By Smith JR, Muggford M, Holland R, Candy B, Noble MJ, Harrison BDW, *et al.*

No. 24

An evaluation of the costs, effectiveness and quality of renal replacement therapy provision in renal satellite units in England and Wales.

By Roderick P, Nicholson T, Armitage A, Mehta R, Mullee M, Gerard K, *et al.*

No. 25

Imatinib for the treatment of patients with unresectable and/or metastatic gastrointestinal stromal tumours: systematic review and economic evaluation.

By Wilson J, Connock M, Song F, Yao G, Fry-Smith A, Raftery J, *et al.*

No. 26

Indirect comparisons of competing interventions.

By Glenny AM, Altman DG, Song F, Sakarovich C, Deeks JJ, D'Amico R, *et al.*

No. 27

Cost-effectiveness of alternative strategies for the initial medical management of non-ST elevation acute coronary syndrome: systematic review and decision-analytical modelling.

By Robinson M, Palmer S, Sculpher M, Philips Z, Ginnelly L, Bowens A, *et al.*

No. 28

Outcomes of electrically stimulated gracilis neosphincter surgery.

By Tillin T, Chambers M, Feldman R.

No. 29

The effectiveness and cost-effectiveness of pimecrolimus and tacrolimus for atopic eczema: a systematic review and economic evaluation.

By Garside R, Stein K, Castelnovo E, Pitt M, Ashcroft D, Dimmock P, *et al.*

No. 30

Systematic review on urine albumin testing for early detection of diabetic complications.

By Newman DJ, Mattock MB, Dawnay ABS, Kerry S, McGuire A, Yaqoob M, *et al.*

No. 31

Randomised controlled trial of the cost-effectiveness of water-based therapy for lower limb osteoarthritis.

By Cochrane T, Davey RC, Matthes Edwards SM.

No. 32

Longer term clinical and economic benefits of offering acupuncture care to patients with chronic low back pain.

By Thomas KJ, MacPherson H, Ratcliffe J, Thorpe L, Brazier J, Campbell M, *et al.*

No. 33

Cost-effectiveness and safety of epidural steroids in the management of sciatica.

By Price C, Arden N, Cogan L, Rogers P.

No. 34

The British Rheumatoid Outcome Study Group (BROSG) randomised controlled trial to compare the effectiveness and cost-effectiveness of aggressive versus symptomatic therapy in established rheumatoid arthritis.

By Symmons D, Tricker K, Roberts C, Davies L, Dawes P, Scott DL.

No. 35

Conceptual framework and systematic review of the effects of participants' and professionals' preferences in randomised controlled trials.

By King M, Nazareth I, Lampe F, Bower P, Chandler M, Morou M, *et al.*

No. 36

The clinical and cost-effectiveness of implantable cardioverter defibrillators: a systematic review.

By Bryant J, Brodin H, Loveman E, Payne E, Clegg A.

No. 37

A trial of problem-solving by community mental health nurses for anxiety, depression and life difficulties among general practice patients. The CPN-GP study.

By Kendrick T, Simons L, Mynors-Wallis L, Gray A, Lathlean J, Pickering R, *et al.*

No. 38

The causes and effects of socio-demographic exclusions from clinical trials.

By Bartlett C, Doyal L, Ebrahim S, Davey P, Bachmann M, Egger M, *et al.*

No. 39

Is hydrotherapy cost-effective? A randomised controlled trial of combined hydrotherapy programmes compared with physiotherapy land techniques in children with juvenile idiopathic arthritis.

By Epps H, Ginnelly L, Utley M, Southwood T, Gallivan S, Sculpher M, *et al.*

No. 40

A randomised controlled trial and cost-effectiveness study of systematic screening (targeted and total population screening) versus routine practice for the detection of atrial fibrillation in people aged 65 and over. The SAFE study.

By Hobbs FDR, Fitzmaurice DA, Mant J, Murray E, Jowett S, Bryan S, *et al.*

No. 41

Displaced intracapsular hip fractures in fit, older people: a randomised comparison of reduction and fixation, bipolar hemiarthroplasty and total hip arthroplasty.

By Keating JF, Grant A, Masson M, Scott NW, Forbes JF.

No. 42

Long-term outcome of cognitive behaviour therapy clinical trials in central Scotland.

By Durham RC, Chambers JA, Power KG, Sharp DM, Macdonald RR, Major KA, *et al.*

No. 43

The effectiveness and cost-effectiveness of dual-chamber pacemakers compared with single-chamber pacemakers for bradycardia due to atrioventricular block or sick sinus syndrome: systematic review and economic evaluation.

By Castelnovo E, Stein K, Pitt M, Garside R, Payne E.

No. 44

Newborn screening for congenital heart defects: a systematic review and cost-effectiveness analysis.

By Knowles R, Griebisch I, Dezateux C, Brown J, Bull C, Wren C.

No. 45

The clinical and cost-effectiveness of left ventricular assist devices for end-stage heart failure: a systematic review and economic evaluation.

By Clegg AJ, Scott DA, Loveman E, Colquitt J, Hutchinson J, Royle P, *et al.*

No. 46

The effectiveness of the Heidelberg Retina Tomograph and laser diagnostic glaucoma scanning system (GDx) in detecting and monitoring glaucoma.

By Kwartz AJ, Henson DB, Harper RA, Spencer AF, McLeod D.

No. 47

Clinical and cost-effectiveness of autologous chondrocyte implantation for cartilage defects in knee joints: systematic review and economic evaluation.

By Clar C, Cummins E, McIntyre L, Thomas S, Lamb J, Bain L, *et al.*

No. 48

Systematic review of effectiveness of different treatments for childhood retinoblastoma.

By McDaid C, Hartley S, Bagnall A-M, Ritchie G, Light K, Riemsma R.

No. 49

Towards evidence-based guidelines for the prevention of venous thromboembolism: systematic reviews of mechanical methods, oral anticoagulation, dextran and regional anaesthesia as thromboprophylaxis.

By Roderick P, Ferris G, Wilson K, Halls H, Jackson D, Collins R, *et al.*

No. 50

The effectiveness and cost-effectiveness of parent training/education programmes for the treatment of conduct disorder, including oppositional defiant disorder, in children.

By Dretzke J, Frew E, Davenport C, Barlow J, Stewart-Brown S, Sandercock J, *et al.*

Volume 10, 2006

No. 1

The clinical and cost-effectiveness of donepezil, rivastigmine, galantamine and memantine for Alzheimer's disease.

By Loveman E, Green C, Kirby J, Takeda A, Picot J, Payne E, *et al.*

No. 2

FOOD: a multicentre randomised trial evaluating feeding policies in patients admitted to hospital with a recent stroke.

By Dennis M, Lewis S, Cranswick G, Forbes J.

No. 3

The clinical effectiveness and cost-effectiveness of computed tomography screening for lung cancer: systematic reviews.

By Black C, Bagust A, Boland A, Walker S, McLeod C, De Verteuil R, *et al.*

No. 4

A systematic review of the effectiveness and cost-effectiveness of neuroimaging assessments used to visualise the seizure focus in people with refractory epilepsy being considered for surgery.

By Whiting P, Gupta R, Burch J, Mujica Mota RE, Wright K, Marson A, *et al.*

No. 5

Comparison of conference abstracts and presentations with full-text articles in the health technology assessments of rapidly evolving technologies.

By Dundar Y, Dodd S, Dickson R, Walley T, Haycox A, Williamson PR.

No. 6

Systematic review and evaluation of methods of assessing urinary incontinence.

By Martin JL, Williams KS, Abrams KR, Turner DA, Sutton AJ, Chapple C, *et al.*

No. 7

The clinical effectiveness and cost-effectiveness of newer drugs for children with epilepsy. A systematic review.

By Connock M, Frew E, Evans B-W, Bryan S, Cummins C, Fry-Smith A, *et al.*

No. 8

Surveillance of Barrett's oesophagus: exploring the uncertainty through systematic review, expert workshop and economic modelling.

By Garside R, Pitt M, Somerville M, Stein K, Price A, Gilbert N.

No. 9

Topotecan, pegylated liposomal doxorubicin hydrochloride and paclitaxel for second-line or subsequent treatment of advanced ovarian cancer: a systematic review and economic evaluation.

By Main C, Bojke L, Griffin S, Norman G, Barbieri M, Mather L, *et al.*

No. 10

Evaluation of molecular techniques in prediction and diagnosis of cytomegalovirus disease in immunocompromised patients.

By Szczepura A, Westmoreland D, Vinogradova Y, Fox J, Clark M.

No. 11

Screening for thrombophilia in high-risk situations: systematic review and cost-effectiveness analysis. The Thrombosis: Risk and Economic Assessment of Thrombophilia Screening (TREATS) study.

By Wu O, Robertson L, Twaddle S, Lowe GDO, Clark P, Greaves M, *et al.*

No. 12

A series of systematic reviews to inform a decision analysis for sampling and treating infected diabetic foot ulcers.

By Nelson EA, O'Meara S, Craig D, Iglesias C, Golder S, Dalton J, *et al.*

No. 13

Randomised clinical trial, observational study and assessment of cost-effectiveness of the treatment of varicose veins (REACTIV trial).

By Michaels JA, Campbell WB, Brazier JE, MacIntyre JB, Palfreyman SJ, Ratcliffe J, *et al.*

No. 14

The cost-effectiveness of screening for oral cancer in primary care.

By Speight PM, Palmer S, Moles DR, Downer MC, Smith DH, Henriksson M, *et al.*

No. 15

Measurement of the clinical and cost-effectiveness of non-invasive diagnostic testing strategies for deep vein thrombosis.

By Goodacre S, Sampson F, Stevenson M, Wailoo A, Sutton A, Thomas S, *et al.*

No. 16

Systematic review of the effectiveness and cost-effectiveness of HealOzone® for the treatment of occlusal pit/fissure caries and root caries.

By Brazzelli M, McKenzie L, Fielding S, Fraser C, Clarkson J, Kilonzo M, *et al.*

No. 17

Randomised controlled trials of conventional antipsychotic versus new atypical drugs, and new atypical drugs versus clozapine, in people with schizophrenia responding poorly to, or intolerant of, current drug treatment.

By Lewis SW, Davies L, Jones PB, Barnes TRE, Murray RM, Kerwin R, *et al.*

No. 18

Diagnostic tests and algorithms used in the investigation of haematuria: systematic reviews and economic evaluation.

By Rodgers M, Nixon J, Hempel S, Aho T, Kelly J, Neal D, *et al.*

No. 19

Cognitive behavioural therapy in addition to antispasmodic therapy for irritable bowel syndrome in primary care: randomised controlled trial.

By Kennedy TM, Chalder T, McCrone P, Darnley S, Knapp M, Jones RH, *et al.*

No. 20

A systematic review of the clinical effectiveness and cost-effectiveness of enzyme replacement therapies for Fabry's disease and mucopolysaccharidosis type I.

By Connock M, Juarez-Garcia A, Frew E, Mans A, Dretzke J, Fry-Smith A, *et al.*

No. 21

Health benefits of antiviral therapy for mild chronic hepatitis C: randomised controlled trial and economic evaluation.

By Wright M, Grieve R, Roberts J, Main J, Thomas HC, on behalf of the UK Mild Hepatitis C Trial Investigators.

No. 22

Pressure relieving support surfaces: a randomised evaluation.

By Nixon J, Nelson EA, Cranny G, Iglesias CP, Hawkins K, Cullum NA, *et al.*

No. 23

A systematic review and economic model of the effectiveness and cost-effectiveness of methylphenidate, dexamfetamine and atomoxetine for the treatment of attention deficit hyperactivity disorder in children and adolescents.

By King S, Griffin S, Hodges Z, Weatherly H, Asseburg C, Richardson G, *et al.*

No. 24

The clinical effectiveness and cost-effectiveness of enzyme replacement therapy for Gaucher's disease: a systematic review.

By Connock M, Burls A, Frew E, Fry-Smith A, Juarez-Garcia A, McCabe C, *et al.*

No. 25

Effectiveness and cost-effectiveness of salicylic acid and cryotherapy for cutaneous warts. An economic decision model.

By Thomas KS, Keogh-Brown MR, Chalmers JR, Fordham RJ, Holland RC, Armstrong SJ, *et al.*

No. 26

A systematic literature review of the effectiveness of non-pharmacological interventions to prevent wandering in dementia and evaluation of the ethical implications and acceptability of their use.

By Robinson L, Hutchings D, Corner L, Beyer F, Dickinson H, Vanoli A, *et al.*

No. 27

A review of the evidence on the effects and costs of implantable cardioverter defibrillator therapy in different patient groups, and modelling of cost-effectiveness and cost-utility for these groups in a UK context.

By Buxton M, Caine N, Chase D, Connelly D, Grace A, Jackson C, *et al.*

No. 28

Adefovir dipivoxil and pegylated interferon alfa-2a for the treatment of chronic hepatitis B: a systematic review and economic evaluation.

By Shepherd J, Jones J, Takeda A, Davidson P, Price A.

No. 29

An evaluation of the clinical and cost-effectiveness of pulmonary artery catheters in patient management in intensive care: a systematic review and a randomised controlled trial.

By Harvey S, Stevens K, Harrison D, Young D, Brampton W, McCabe C, *et al.*

No. 30

Accurate, practical and cost-effective assessment of carotid stenosis in the UK.

By Wardlaw JM, Chappell FM, Stevenson M, De Nigris E, Thomas S, Gillard J, *et al.*

No. 31

Etanercept and infliximab for the treatment of psoriatic arthritis: a systematic review and economic evaluation.

By Woolacott N, Bravo Vergel Y, Hawkins N, Kainth A, Khadjesari Z, Misso K, *et al.*

No. 32

The cost-effectiveness of testing for hepatitis C in former injecting drug users.

By Castelnovo E, Thompson-Coon J, Pitt M, Cramp M, Siebert U, Price A, *et al.*

No. 33

Computerised cognitive behaviour therapy for depression and anxiety update: a systematic review and economic evaluation.

By Kaltenthaler E, Brazier J, De Nigris E, Tumor I, Ferriter M, Beverley C, *et al.*

No. 34

Cost-effectiveness of using prognostic information to select women with breast cancer for adjuvant systemic therapy.

By Williams C, Brunskill S, Altman D, Briggs A, Campbell H, Clarke M, *et al.*

No. 35

Psychological therapies including dialectical behaviour therapy for borderline personality disorder: a systematic review and preliminary economic evaluation.

By Brazier J, Tumor I, Holmes M, Ferriter M, Parry G, Dent-Brown K, *et al.*

No. 36

Clinical effectiveness and cost-effectiveness of tests for the diagnosis and investigation of urinary tract infection in children: a systematic review and economic model.

By Whiting P, Westwood M, Bojke L, Palmer S, Richardson G, Cooper J, *et al.*

No. 37

Cognitive behavioural therapy in chronic fatigue syndrome: a randomised controlled trial of an outpatient group programme.

By O'Dowd H, Gladwell P, Rogers CA, Hollinghurst S, Gregory A.

No. 38

A comparison of the cost-effectiveness of five strategies for the prevention of nonsteroidal anti-inflammatory drug-induced gastrointestinal toxicity: a systematic review with economic modelling.

By Brown TJ, Hooper L, Elliott RA, Payne K, Webb R, Roberts C, *et al.*

No. 39

The effectiveness and cost-effectiveness of computed tomography screening for coronary artery disease: systematic review.

By Waugh N, Black C, Walker S, McIntyre L, Cummins E, Hillis G.

No. 40

What are the clinical outcome and cost-effectiveness of endoscopy undertaken by nurses when compared with doctors? A Multi-Institution Nurse Endoscopy Trial (MINuET).

By Williams J, Russell I, Durai D, Cheung W-Y, Farrin A, Bloor K, *et al.*

No. 41

The clinical and cost-effectiveness of oxaliplatin and capecitabine for the adjuvant treatment of colon cancer: systematic review and economic evaluation.

By Pandor A, Eggington S, Paisley S, Tappenden P, Sutcliffe P.

No. 42

A systematic review of the effectiveness of adalimumab, etanercept and infliximab for the treatment of rheumatoid arthritis in adults and an economic evaluation of their cost-effectiveness.

By Chen Y-F, Jobanputra P, Barton P, Jowett S, Bryan S, Clark W, *et al.*

No. 43

Telemedicine in dermatology: a randomised controlled trial.

By Bowns IR, Collins K, Walters SJ, McDonagh AJG.

No. 44

Cost-effectiveness of cell salvage and alternative methods of minimising perioperative allogeneic blood transfusion: a systematic review and economic model.

By Davies L, Brown TJ, Haynes S, Payne K, Elliott RA, McCollum C.

No. 45

Clinical effectiveness and cost-effectiveness of laparoscopic surgery for colorectal cancer: systematic reviews and economic evaluation.

By Murray A, Lourenco T, de Verteuil R, Hernandez R, Fraser C, McKinley A, *et al.*

No. 46

Etanercept and efalizumab for the treatment of psoriasis: a systematic review.

By Woolacott N, Hawkins N, Mason A, Kainth A, Khadjesari Z, Bravo Vergel Y, *et al.*

No. 47

Systematic reviews of clinical decision tools for acute abdominal pain.

By Liu JLY, Wyatt JC, Deeks JJ, Clamp S, Keen J, Verde P, *et al.*

No. 48

Evaluation of the ventricular assist device programme in the UK.

By Sharples L, Buxton M, Caine N, Cafferty F, Demiris N, Dyer M, *et al.*

No. 49

A systematic review and economic model of the clinical and cost-effectiveness of immunosuppressive therapy for renal transplantation in children.

By Yao G, Albon E, Adi Y, Milford D, Bayliss S, Ready A, *et al.*

No. 50

Amniocentesis results: investigation of anxiety. The ARIA trial.

By Hewison J, Nixon J, Fountain J, Cocks K, Jones C, Mason G, *et al.*

Volume 11, 2007

No. 1

Pemetrexed disodium for the treatment of malignant pleural mesothelioma: a systematic review and economic evaluation.

By Dundar Y, Bagust A, Dickson R, Dodd S, Green J, Haycox A, *et al.*

No. 2

A systematic review and economic model of the clinical effectiveness and cost-effectiveness of docetaxel in combination with prednisone or prednisolone for the treatment of hormone-refractory metastatic prostate cancer.

By Collins R, Fenwick E, Trowman R, Perard R, Norman G, Light K, *et al.*

No. 3

A systematic review of rapid diagnostic tests for the detection of tuberculosis infection.

By Dinnes J, Deeks J, Kunst H, Gibson A, Cummins E, Waugh N, *et al.*

No. 4

The clinical effectiveness and cost-effectiveness of strontium ranelate for the prevention of osteoporotic fragility fractures in postmenopausal women.

By Stevenson M, Davis S, Lloyd-Jones M, Beverley C.

No. 5

A systematic review of quantitative and qualitative research on the role and effectiveness of written information available to patients about individual medicines.

By Raynor DK, Blenkinsopp A, Knapp P, Grime J, Nicolson DJ, Pollock K, *et al.*

No. 6

Oral naltrexone as a treatment for relapse prevention in formerly opioid-dependent drug users: a systematic review and economic evaluation.

By Adi Y, Juarez-Garcia A, Wang D, Jowett S, Frew E, Day E, *et al.*

No. 7

Glucocorticoid-induced osteoporosis: a systematic review and cost-utility analysis.

By Kanis JA, Stevenson M, McCloskey EV, Davis S, Lloyd-Jones M.

No. 8

Epidemiological, social, diagnostic and economic evaluation of population screening for genital chlamydial infection.

By Low N, McCarthy A, Macleod J, Salisbury C, Campbell R, Roberts TE, *et al.*

No. 9

Methadone and buprenorphine for the management of opioid dependence: a systematic review and economic evaluation.

By Connock M, Juarez-Garcia A, Jowett S, Frew E, Liu Z, Taylor RJ, *et al.*

No. 10

Exercise Evaluation Randomised Trial (EXERT): a randomised trial comparing GP referral for leisure centre-based exercise, community-based walking and advice only.

By Isaacs AJ, Critchley JA, See Tai S, Buckingham K, Westley D, Harridge SDR, *et al.*

No. 11

Interferon alfa (pegylated and non-pegylated) and ribavirin for the treatment of mild chronic hepatitis C: a systematic review and economic evaluation.

By Shepherd J, Jones J, Hartwell D, Davidson P, Price A, Waugh N.

No. 12

Systematic review and economic evaluation of bevacizumab and cetuximab for the treatment of metastatic colorectal cancer.

By Tappenden P, Jones R, Paisley S, Carroll C.

No. 13

A systematic review and economic evaluation of epoetin alfa, epoetin beta and darbepoetin alfa in anaemia associated with cancer, especially that attributable to cancer treatment.

By Wilson J, Yao GL, Raftery J, Bohlius J, Brunskill S, Sandercock J, *et al.*

No. 14

A systematic review and economic evaluation of statins for the prevention of coronary events.

By Ward S, Lloyd Jones M, Pandor A, Holmes M, Ara R, Ryan A, *et al.*

No. 15

A systematic review of the effectiveness and cost-effectiveness of different models of community-based respite care for frail older people and their carers.

By Mason A, Weatherly H, Spilsbury K, Arksey H, Golder S, Adamson J, *et al.*

No. 16

Additional therapy for young children with spastic cerebral palsy: a randomised controlled trial.

By Weindling AM, Cunningham CC, Glenn SM, Edwards RT, Reeves DJ.

No. 17

Screening for type 2 diabetes: literature review and economic modelling.

By Waugh N, Scotland G, McNamee P, Gillett M, Brennan A, Goyder E, *et al.*

No. 18

The effectiveness and cost-effectiveness of cinacalcet for secondary hyperparathyroidism in end-stage renal disease patients on dialysis: a systematic review and economic evaluation.

By Garside R, Pitt M, Anderson R, Mealing S, Roome C, Snaith A, *et al.*

No. 19

The clinical effectiveness and cost-effectiveness of gemcitabine for metastatic breast cancer: a systematic review and economic evaluation.

By Takeda AL, Jones J, Loveman E, Tan SC, Clegg AJ.

No. 20

A systematic review of duplex ultrasound, magnetic resonance angiography and computed tomography angiography for the diagnosis and assessment of symptomatic, lower limb peripheral arterial disease.

By Collins R, Cranny G, Burch J, Aguiar-Ibáñez R, Craig D, Wright K, *et al.*

No. 21

The clinical effectiveness and cost-effectiveness of treatments for children with idiopathic steroid-resistant nephrotic syndrome: a systematic review.

By Colquitt JL, Kirby J, Green C, Cooper K, Trompeter RS.

No. 22

A systematic review of the routine monitoring of growth in children of primary school age to identify growth-related conditions.

By Fayer D, Nixon J, Hartley S, Rithalia A, Butler G, Rudolf M, *et al.*

No. 23

Systematic review of the effectiveness of preventing and treating *Staphylococcus aureus* carriage in reducing peritoneal catheter-related infections.

By McCormack K, Rabindranath K, Kilonzo M, Vale L, Fraser C, McIntyre L, *et al.*

No. 24

The clinical effectiveness and cost of repetitive transcranial magnetic stimulation versus electroconvulsive therapy in severe depression: a multicentre pragmatic randomised controlled trial and economic analysis.

By McLoughlin DM, Mogg A, Eranti S, Pluck G, Purvis R, Edwards D, *et al.*

No. 25

A randomised controlled trial and economic evaluation of direct versus indirect and individual versus group modes of speech and language therapy for children with primary language impairment.

By Boyle J, McCartney E, Forbes J, O'Hare A.

No. 26

Hormonal therapies for early breast cancer: systematic review and economic evaluation.

By Hind D, Ward S, De Nigris E, Simpson E, Carroll C, Wyld L.

No. 27

Cardioprotection against the toxic effects of anthracyclines given to children with cancer: a systematic review.

By Bryant J, Picot J, Levitt G, Sullivan I, Baxter L, Clegg A.

No. 28

Adalimumab, etanercept and infliximab for the treatment of ankylosing spondylitis: a systematic review and economic evaluation.

By McLeod C, Bagust A, Boland A, Dagenais P, Dickson R, Dundar Y, *et al.*

No. 29

Prenatal screening and treatment strategies to prevent group B streptococcal and other bacterial infections in early infancy: cost-effectiveness and expected value of information analyses.

By Colbourn T, Asseburg C, Bojke L, Phillips Z, Claxton K, Ades AE, *et al.*

No. 30

Clinical effectiveness and cost-effectiveness of bone morphogenetic proteins in the non-healing of fractures and spinal fusion: a systematic review.

By Garrison KR, Donell S, Ryder J, Shemilt I, Mugford M, Harvey I, *et al.*

No. 31

A randomised controlled trial of postoperative radiotherapy following breast-conserving surgery in a minimum-risk older population. The PRIME trial.

By Prescott RJ, Kunkler IH, Williams LJ, King CC, Jack W, van der Pol M, *et al.*

No. 32

Current practice, accuracy, effectiveness and cost-effectiveness of the school entry hearing screen.

By Bamford J, Fortnum H, Bristow K, Smith J, Vamvakas G, Davies L, *et al.*

No. 33

The clinical effectiveness and cost-effectiveness of inhaled insulin in diabetes mellitus: a systematic review and economic evaluation.

By Black C, Cummins E, Royle P, Philip S, Waugh N.

No. 34

Surveillance of cirrhosis for hepatocellular carcinoma: systematic review and economic analysis.

By Thompson Coon J, Rogers G, Hewson P, Wright D, Anderson R, Cramp M, *et al.*

No. 35

The Birmingham Rehabilitation Uptake Maximisation Study (BRUM). Homebased compared with hospital-based cardiac rehabilitation in a multi-ethnic population: cost-effectiveness and patient adherence.

By Jolly K, Taylor R, Lip GYH, Greenfield S, Raftery J, Mant J, *et al.*

No. 36

A systematic review of the clinical, public health and cost-effectiveness of rapid diagnostic tests for the detection and identification of bacterial intestinal pathogens in faeces and food.

By Abubakar I, Irvine L, Aldus CF, Wyatt GM, Fordham R, Schelenz S, *et al.*

No. 37

A randomised controlled trial examining the longer-term outcomes of standard versus new antiepileptic drugs. The SANAD trial.

By Marson AG, Appleton R, Baker GA, Chadwick DW, Doughty J, Eaton B, *et al.*

No. 38

Clinical effectiveness and cost-effectiveness of different models of managing long-term oral anti-coagulation therapy: a systematic review and economic modelling.

By Connock M, Stevens C, Fry-Smith A, Jowett S, Fitzmaurice D, Moore D, *et al.*

No. 39

A systematic review and economic model of the clinical effectiveness and cost-effectiveness of interventions for preventing relapse in people with bipolar disorder.

By Soares-Weiser K, Bravo Vergel Y, Beynon S, Dunn G, Barbieri M, Duffy S, *et al.*

No. 40

Taxanes for the adjuvant treatment of early breast cancer: systematic review and economic evaluation.

By Ward S, Simpson E, Davis S, Hind D, Rees A, Wilkinson A.

No. 41

The clinical effectiveness and cost-effectiveness of screening for open angle glaucoma: a systematic review and economic evaluation.

By Burr JM, Mowatt G, Hernández R, Siddiqui MAR, Cook J, Lourenco T, *et al.*

No. 42

Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models.

By Davis A, Smith P, Ferguson M, Stephens D, Gianopoulos I.

No. 43

Contamination in trials of educational interventions.

By Keogh-Brown MR, Bachmann MO, Shepstone L, Hewitt C, Howe A, Ramsay CR, *et al.*

No. 44

Overview of the clinical effectiveness of positron emission tomography imaging in selected cancers.

By Facey K, Bradbury I, Laking G, Payne E.

No. 45

The effectiveness and cost-effectiveness of carmustine implants and temozolomide for the treatment of newly diagnosed high-grade glioma: a systematic review and economic evaluation.

By Garside R, Pitt M, Anderson R, Rogers G, Dyer M, Mealing S, *et al.*

No. 46

Drug-eluting stents: a systematic review and economic evaluation.

By Hill RA, Boland A, Dickson R, Dünder Y, Haycox A, McLeod C, *et al.*

No. 47

The clinical effectiveness and cost-effectiveness of cardiac resynchronisation (biventricular pacing) for heart failure: systematic review and economic model.

By Fox M, Mealing S, Anderson R, Dean J, Stein K, Price A, *et al.*

No. 48

Recruitment to randomised trials: strategies for trial enrolment and participation study. The STEPS study.

By Campbell MK, Snowdon C, Francis D, Elbourne D, McDonald AM, Knight R, *et al.*

No. 49

Cost-effectiveness of functional cardiac testing in the diagnosis and management of coronary artery disease: a randomised controlled trial. The CECaT trial.

By Sharples L, Hughes V, Crean A, Dyer M, Buxton M, Goldsmith K, *et al.*

No. 50

Evaluation of diagnostic tests when there is no gold standard. A review of methods.

By Rutjes AWS, Reitsma JB, Coomarasamy A, Khan KS, Bossuyt PMM.

No. 51

Systematic reviews of the clinical effectiveness and cost-effectiveness of proton pump inhibitors in acute upper gastrointestinal bleeding.

By Leontiadis GI, Sreedharan A, Dorward S, Barton P, Delaney B, Howden CW, *et al.*

No. 52

A review and critique of modelling in prioritising and designing screening programmes.

By Karnon J, Goyder E, Tappenden P, McPhie S, Towers I, Brazier J, *et al.*

No. 53

An assessment of the impact of the NHS Health Technology Assessment Programme.

By Hanney S, Buxton M, Green C, Coulson D, Raftery J.

Volume 12, 2008

No. 1

A systematic review and economic model of switching from nonglycopeptide to glycopeptide antibiotic prophylaxis for surgery.

By Cranny G, Elliott R, Weatherly H, Chambers D, Hawkins N, Myers L, *et al.*

No. 2

'Cut down to quit' with nicotine replacement therapies in smoking cessation: a systematic review of effectiveness and economic analysis.

By Wang D, Connock M, Barton P, Fry-Smith A, Aveyard P, Moore D.

No. 3

A systematic review of the effectiveness of strategies for reducing fracture risk in children with juvenile idiopathic arthritis with additional data on long-term risk of fracture and cost of disease management.

By Thornton J, Ashcroft D, O'Neill T, Elliott R, Adams J, Roberts C, *et al.*

No. 4

Does befriending by trained lay workers improve psychological well-being and quality of life for carers of people with dementia, and at what cost? A randomised controlled trial.

By Charlesworth G, Shepstone L, Wilson E, Thalanany M, Mugford M, Poland F.

No. 5

A multi-centre retrospective cohort study comparing the efficacy, safety and cost-effectiveness of hysterectomy and uterine artery embolisation for the treatment of symptomatic uterine fibroids. The HOPEFUL study.

By Hirst A, Dutton S, Wu O, Briggs A, Edwards C, Waldenmaier L, *et al.*

No. 6

Methods of prediction and prevention of pre-eclampsia: systematic reviews of accuracy and effectiveness literature with economic modelling.

By Meads CA, Cnossen JS, Meher S, Juarez-Garcia A, ter Riet G, Duley L, *et al.*

No. 7

The use of economic evaluations in NHS decision-making: a review and empirical investigation.

By Williams I, McIver S, Moore D, Bryan S.

No. 8

Stapled haemorrhoidectomy (haemorrhoidopexy) for the treatment of haemorrhoids: a systematic review and economic evaluation.

By Burch J, Epstein D, Baba-Akbari A, Weatherly H, Fox D, Golder S, *et al.*

No. 9

The clinical effectiveness of diabetes education models for Type 2 diabetes: a systematic review.

By Loveman E, Frampton GK, Clegg AJ.

No. 10

Payment to healthcare professionals for patient recruitment to trials: systematic review and qualitative study.

By Raftery J, Bryant J, Powell J, Kerr C, Hawker S.

No. 11

Cyclooxygenase-2 selective non-steroidal anti-inflammatory drugs (etodolac, meloxicam, celecoxib, rofecoxib, etoricoxib, valdecoxib and lumiracoxib) for osteoarthritis and rheumatoid arthritis: a systematic review and economic evaluation.

By Chen Y-F, Jobanputra P, Barton P, Bryan S, Fry-Smith A, Harris G, *et al.*

No. 12

The clinical effectiveness and cost-effectiveness of central venous catheters treated with anti-infective agents in preventing bloodstream infections: a systematic review and economic evaluation.

By Hockenhull JC, Dwan K, Boland A, Smith G, Bagust A, Dundar Y, *et al.*

No. 13

Stepped treatment of older adults on laxatives. The STOOL trial.

By Mihaylov S, Stark C, McColl E, Steen N, Vanoli A, Rubin G, *et al.*

No. 14

A randomised controlled trial of cognitive behaviour therapy in adolescents with major depression treated by selective serotonin reuptake inhibitors. The ADAPT trial.

By Goodyer IM, Dubicka B, Wilkinson P, Kelvin R, Roberts C, Byford S, *et al.*

No. 15

The use of irinotecan, oxaliplatin and raltitrexed for the treatment of advanced colorectal cancer: systematic review and economic evaluation.

By Hind D, Tappenden P, Tumor I, Eggington E, Sutcliffe P, Ryan A.

No. 16

Ranibizumab and pegaptanib for the treatment of age-related macular degeneration: a systematic review and economic evaluation.

By Colquitt JL, Jones J, Tan SC, Takeda A, Clegg AJ, Price A.

No. 17

Systematic review of the clinical effectiveness and cost-effectiveness of 64-slice or higher computed tomography angiography as an alternative to invasive coronary angiography in the investigation of coronary artery disease.

By Mowatt G, Cummins E, Waugh N, Walker S, Cook J, Jia X, *et al.*

No. 18

Structural neuroimaging in psychosis: a systematic review and economic evaluation.

By Albon E, Tsourapas A, Frew E, Davenport C, Oyebo F, Bayliss S, *et al.*

No. 19

Systematic review and economic analysis of the comparative effectiveness of different inhaled corticosteroids and their usage with long-acting beta₂ agonists for the treatment of chronic asthma in adults and children aged 12 years and over.

By Shepherd J, Rogers G, Anderson R, Main C, Thompson-Coon J, Hartwell D, *et al.*

No. 20

Systematic review and economic analysis of the comparative effectiveness of different inhaled corticosteroids and their usage with long-acting beta₂ agonists for the treatment of chronic asthma in children under the age of 12 years.

By Main C, Shepherd J, Anderson R, Rogers G, Thompson-Coon J, Liu Z, *et al.*

No. 21

Ezetimibe for the treatment of hypercholesterolaemia: a systematic review and economic evaluation.

By Ara R, Tumor I, Pandor A, Duenas A, Williams R, Wilkinson A, *et al.*

No. 22

Topical or oral ibuprofen for chronic knee pain in older people. The TOIB study.

By Underwood M, Ashby D, Carnes D, Castelnovo E, Cross P, Harding G, *et al.*

No. 23

A prospective randomised comparison of minor surgery in primary and secondary care. The MiSTIC trial.

By George S, Pockney P, Primrose J, Smith H, Little P, Kinley H, *et al.*

No. 24

A review and critical appraisal of measures of therapist-patient interactions in mental health settings.

By Cahill J, Barkham M, Hardy G, Gilbody S, Richards D, Bower P, *et al.*

No. 25

The clinical effectiveness and cost-effectiveness of screening programmes for amblyopia and strabismus in children up to the age of 4–5 years: a systematic review and economic evaluation.

By Carlton J, Karnon J, Czoski-Murray C, Smith KJ, Marr J.

No. 26

A systematic review of the clinical effectiveness and cost-effectiveness and economic modelling of minimal incision total hip replacement approaches in the management of arthritic disease of the hip.

By de Verteuil R, Imamura M, Zhu S, Glazener C, Fraser C, Munro N, *et al.*

No. 27

A preliminary model-based assessment of the cost-utility of a screening programme for early age-related macular degeneration.

By Karnon J, Czoski-Murray C, Smith K, Brand C, Chakravarthy U, Davis S, *et al.*

No. 28

Intravenous magnesium sulphate and sotalol for prevention of atrial fibrillation after coronary artery bypass surgery: a systematic review and economic evaluation.

By Shepherd J, Jones J, Frampton GK, Tanajewski L, Turner D, Price A.

No. 29

Absorbent products for urinary/faecal incontinence: a comparative evaluation of key product categories.

By Fader M, Cottenden A, Getliffe K, Gage H, Clarke-O'Neill S, Jamieson K, *et al.*

No. 30

A systematic review of repetitive functional task practice with modelling of resource use, costs and effectiveness.

By French B, Leathley M, Sutton C, McAdam J, Thomas L, Forster A, *et al.*

No. 31

The effectiveness and cost-effectiveness of minimal access surgery amongst people with gastro-oesophageal reflux disease – a UK collaborative study. The REFLUX trial.

By Grant A, Wileman S, Ramsay C, Bojke L, Epstein D, Sculpher M, *et al.*

No. 32

Time to full publication of studies of anti-cancer medicines for breast cancer and the potential for publication bias: a short systematic review.

By Takeda A, Loveman E, Harris P, Hartwell D, Welch K.

No. 33

Performance of screening tests for child physical abuse in accident and emergency departments.

By Woodman J, Pitt M, Wentz R, Taylor B, Hodes D, Gilbert RE.

No. 34

Curative catheter ablation in atrial fibrillation and typical atrial flutter: systematic review and economic evaluation.

By Rodgers M, McKenna C, Palmer S, Chambers D, Van Hout S, Golder S, *et al.*

No. 35

Systematic review and economic modelling of effectiveness and cost utility of surgical treatments for men with benign prostatic enlargement.

By Lourenco T, Armstrong N, N'Dow J, Nabi G, Deverill M, Pickard R, *et al.*

No. 36

Immunoprophylaxis against respiratory syncytial virus (RSV) with palivizumab in children: a systematic review and economic evaluation.

By Wang D, Cummins C, Bayliss S, Sandercock J, Burls A.

Volume 13, 2009**No. 1**

Deferasirox for the treatment of iron overload associated with regular blood transfusions (transfusional haemosiderosis) in patients suffering with chronic anaemia: a systematic review and economic evaluation.

By McLeod C, Fleeman N, Kirkham J, Bagust A, Boland A, Chu P, *et al.*

No. 2

Thrombophilia testing in people with venous thromboembolism: systematic review and cost-effectiveness analysis.

By Simpson EL, Stevenson MD, Rawdin A, Papaioannou D.

No. 3

Surgical procedures and non-surgical devices for the management of non-apnoeic snoring: a systematic review of clinical effects and associated treatment costs.

By Main C, Liu Z, Welch K, Weiner G, Quentin Jones S, Stein K.

No. 4

Continuous positive airway pressure devices for the treatment of obstructive sleep apnoea-hypopnoea syndrome: a systematic review and economic analysis.

By McDaid C, Griffin S, Weatherly H, Durée K, van der Burgt M, van Hout S, Akers J, *et al.*

No. 5

Use of classical and novel biomarkers as prognostic risk factors for localised prostate cancer: a systematic review.

By Sutcliffe P, Hummel S, Simpson E, Young T, Rees A, Wilkinson A, *et al.*

No. 6

The harmful health effects of recreational ecstasy: a systematic review of observational evidence.

By Rogers G, Elston J, Garside R, Roome C, Taylor R, Younger P, *et al.*

No. 7

Systematic review of the clinical effectiveness and cost-effectiveness of oesophageal Doppler monitoring in critically ill and high-risk surgical patients.

By Mowatt G, Houston G, Hernández R, de Verteuil R, Fraser C, Cuthbertson B, *et al.*

No. 8

The use of surrogate outcomes in model-based cost-effectiveness analyses: a survey of UK Health Technology Assessment reports.

By Taylor RS, Elston J.

No. 9

Controlling Hypertension and Hypotension Immediately Post Stroke (CHHIPS) – a randomised controlled trial.

By Potter J, Mistri A, Brodie F, Chernova J, Wilson E, Jagger C, *et al.*

No. 10

Routine antenatal anti-D prophylaxis for RhD-negative women: a systematic review and economic evaluation.

By Pilgrim H, Lloyd-Jones M, Rees A.

No. 11

Amantadine, oseltamivir and zanamivir for the prophylaxis of influenza (including a review of existing guidance no. 67): a systematic review and economic evaluation.

By Tappenden P, Jackson R, Cooper K, Rees A, Simpson E, Read R, *et al.*

No. 12

Improving the evaluation of therapeutic interventions in multiple sclerosis: the role of new psychometric methods.

By Hobart J, Cano S.

No. 13

Treatment of severe ankle sprain: a pragmatic randomised controlled trial comparing the clinical effectiveness and cost-effectiveness of three types of mechanical ankle support with tubular bandage. The CAST trial.

By Cooke MW, Marsh JL, Clark M, Nakash R, Jarvis RM, Hutton JL, *et al.*, on behalf of the CAST trial group.

No. 14

Non-occupational postexposure prophylaxis for HIV: a systematic review.

By Bryant J, Baxter L, Hird S.

No. 15

Blood glucose self-monitoring in type 2 diabetes: a randomised controlled trial.

By Farmer AJ, Wade AN, French DP, Simon J, Yudkin P, Gray A, *et al.*

No. 16

How far does screening women for domestic (partner) violence in different health-care settings meet criteria for a screening programme? Systematic reviews of nine UK National Screening Committee criteria.

By Feder G, Ramsay J, Dunne D, Rose M, Arsene C, Norman R, *et al.*

No. 17

Spinal cord stimulation for chronic pain of neuropathic or ischaemic origin: systematic review and economic evaluation.

By Simpson, EL, Duenas A, Holmes MW, Papaioannou D, Chilcott J.

No. 18

The role of magnetic resonance imaging in the identification of suspected acoustic neuroma: a systematic review of clinical and cost-effectiveness and natural history.

By Fortnum H, O'Neill C, Taylor R, Lenthall R, Nikolopoulos T, Lightfoot G, *et al.*

No. 19

Dipsticks and diagnostic algorithms in urinary tract infection: development and validation, randomised trial, economic analysis, observational cohort and qualitative study.

By Little P, Turner S, Rumsby K, Warner G, Moore M, Lowes JA, *et al.*

No. 20

Systematic review of respite care in the frail elderly.

By Shaw C, McNamara R, Abrams K, Cannings-John R, Hood K, Longo M, *et al.*

No. 21

Neuroleptics in the treatment of aggressive challenging behaviour for people with intellectual disabilities: a randomised controlled trial (NACHBID).

By Tyrer P, Oliver-Africano P, Romeo R, Knapp M, Dickens S, Bouras N, *et al.*

No. 22

Randomised controlled trial to determine the clinical effectiveness and cost-effectiveness of selective serotonin reuptake inhibitors plus supportive care, versus supportive care alone, for mild to moderate depression with somatic symptoms in primary care: the THREAD (THREShold for AntiDepressant response) study.

By Kendrick T, Chatwin J, Dowrick C, Tylee A, Morriss R, Peveler R, *et al.*

No. 23

Diagnostic strategies using DNA testing for hereditary haemochromatosis in at-risk populations: a systematic review and economic evaluation.

By Bryant J, Cooper K, Picot J, Clegg A, Roderick P, Rosenberg W, *et al.*

No. 24

Enhanced external counterpulsation for the treatment of stable angina and heart failure: a systematic review and economic analysis.

By McKenna C, McDaid C, Suekarran S, Hawkins N, Claxton K, Light K, *et al.*

No. 25

Development of a decision support tool for primary care management of patients with abnormal liver function tests without clinically apparent liver disease: a record-linkage population cohort study and decision analysis (ALFIE).

By Donnan PT, McLernon D, Dillon JF, Ryder S, Roderick P, Sullivan F, *et al.*

No. 26

A systematic review of presumed consent systems for deceased organ donation.

By Rithalia A, McDaid C, Suekarran S, Norman G, Myers L, Sowden A.

No. 27

Paracetamol and ibuprofen for the treatment of fever in children: the PITCH randomised controlled trial.

By Hay AD, Redmond NM, Costelloe C, Montgomery AA, Fletcher M, Hollinghurst S, *et al.*

No. 28

A randomised controlled trial to compare minimally invasive glucose monitoring devices with conventional monitoring in the management of insulin-treated diabetes mellitus (MITRE).

By Newman SP, Cooke D, Casbard A, Walker S, Meredith S, Nunn A, *et al.*

No. 29

Sensitivity analysis in economic evaluation: an audit of NICE current practice and a review of its use and value in decision-making.

By Andronis L, Barton P, Bryan S.

Suppl. 1

Trastuzumab for the treatment of primary breast cancer in HER2-positive women: a single technology appraisal.

By Ward S, Pilgrim H, Hind D.

Docetaxel for the adjuvant treatment of early node-positive breast cancer: a single technology appraisal.

By Chilcott J, Lloyd Jones M, Wilkinson A.

The use of paclitaxel in the management of early stage breast cancer.

By Griffin S, Dunn G, Palmer S, Macfarlane K, Brent S, Dyker A, *et al.*

Rituximab for the first-line treatment of stage III/IV follicular non-Hodgkin's lymphoma.

By Dundar Y, Bagust A, Hounsome J, McLeod C, Boland A, Davis H, *et al.*

Bortezomib for the treatment of multiple myeloma patients.

By Green C, Bryant J, Takeda A, Cooper K, Clegg A, Smith A, *et al.*

Fludarabine phosphate for the first-line treatment of chronic lymphocytic leukaemia.

By Walker S, Palmer S, Erhorn S, Brent S, Dyker A, Ferrie L, *et al.*

Erlotinib for the treatment of relapsed non-small cell lung cancer.

By McLeod C, Bagust A, Boland A, Hockenhull J, Dundar Y, Proudlove C, *et al.*

Cetuximab plus radiotherapy for the treatment of locally advanced squamous cell carcinoma of the head and neck.

By Griffin S, Walker S, Sculpher M, White S, Erhorn S, Brent S, *et al.*

Infliximab for the treatment of adults with psoriasis.

By Loveman E, Turner D, Hartwell D, Cooper K, Clegg A.

No. 30

Psychological interventions for postnatal depression: cluster randomised trial and economic evaluation. The PoNDER trial.

By Morrell CJ, Warner R, Slade P, Dixon S, Walters S, Paley G, *et al.*

No. 31

The effect of different treatment durations of clopidogrel in patients with non-ST-segment elevation acute coronary syndromes: a systematic review and value of information analysis.

By Rogowski R, Burch J, Palmer S, Craigs C, Golder S, Woolacott N.

No. 32

Systematic review and individual patient data meta-analysis of diagnosis of heart failure, with modelling of implications of different diagnostic strategies in primary care.

By Mant J, Doust J, Roalfe A, Barton P, Cowie MR, Glasziou P, *et al.*

No. 33

A multicentre randomised controlled trial of the use of continuous positive airway pressure and non-invasive positive pressure ventilation in the early treatment of patients presenting to the emergency department with severe acute cardiogenic pulmonary oedema: the 3CPO trial.

By Gray AJ, Goodacre S, Newby DE, Masson MA, Sampson F, Dixon S, *et al.*, on behalf of the 3CPO study investigators.

No. 34

Early high-dose lipid-lowering therapy to avoid cardiac events: a systematic review and economic evaluation.

By Ara R, Pandor A, Stevens J, Rees A, Rafia R.

No. 35

Adefovir dipivoxil and pegylated interferon alpha for the treatment of chronic hepatitis B: an updated systematic review and economic evaluation.

By Jones J, Shepherd J, Baxter L, Gospodarevskaya E, Hartwell D, Harris P, *et al.*

No. 36

Methods to identify postnatal depression in primary care: an integrated evidence synthesis and value of information analysis.

By Hewitt CE, Gilbody SM, Brealey S, Paulden M, Palmer S, Mann R, *et al.*

No. 37

A double-blind randomised placebo-controlled trial of topical intranasal corticosteroids in 4- to 11-year-old children with persistent bilateral otitis media with effusion in primary care.

By Williamson I, Benges S, Barton S, Petrou S, Letley L, Fasey N, *et al.*

No. 38

The effectiveness and cost-effectiveness of methods of storing donated kidneys from deceased donors: a systematic review and economic model.

By Bond M, Pitt M, Akoh J, Moxham T, Hoyle M, Anderson R.

No. 39

Rehabilitation of older patients: day hospital compared with rehabilitation at home. A randomised controlled trial.

By Parker SG, Oliver P, Pennington M, Bond J, Jagger C, Enderby PM, *et al.*

No. 40

Breastfeeding promotion for infants in neonatal units: a systematic review and economic analysis

By Renfrew MJ, Craig D, Dyson L, McCormick F, Rice S, King SE, *et al.*

No. 41

The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation.

By Picot J, Jones J, Colquitt JL, Gospodarevskaya E, Loveman E, Baxter L, *et al.*

No. 42

Rapid testing for group B streptococcus during labour: a test accuracy study with evaluation of acceptability and cost-effectiveness.

By Daniels J, Gray J, Pattison H, Roberts T, Edwards E, Milner P, *et al.*

No. 43

Screening to prevent spontaneous preterm birth: systematic reviews of accuracy and effectiveness literature with economic modelling.

By Honest H, Forbes CA, Durée KH, Norman G, Duffy SB, Tsourapas A, *et al.*

No. 44

The effectiveness and cost-effectiveness of cochlear implants for severe to profound deafness in children and adults: a systematic review and economic model.

By Bond M, Mealing S, Anderson R, Elston J, Weiner G, Taylor RS, *et al.*

Suppl. 2

Gemcitabine for the treatment of metastatic breast cancer.

By Jones J, Takeda A, Tan SC, Cooper K, Loveman E, Clegg A.

Varenicline in the management of smoking cessation: a single technology appraisal.

By Hind D, Tappenden P, Peters J, Kenjegalieva K.

Alteplase for the treatment of acute ischaemic stroke: a single technology appraisal.

By Lloyd Jones M, Holmes M.

Rituximab for the treatment of rheumatoid arthritis.

By Bagust A, Boland A, Hockenhull J, Fleeman N, Greenhalgh J, Dundar Y, *et al.*

Omaliuzumab for the treatment of severe persistent allergic asthma.

By Jones J, Shepherd J, Hartwell D, Harris P, Cooper K, Takeda A, *et al.*

Rituximab for the treatment of relapsed or refractory stage III or IV follicular non-Hodgkin's lymphoma.

By Boland A, Bagust A, Hockenhull J, Davis H, Chu P, Dickson R.

Adalimumab for the treatment of psoriasis.

By Turner D, Picot J, Cooper K, Loveman E.

Dabigatran etexilate for the prevention of venous thromboembolism in patients undergoing elective hip and knee surgery: a single technology appraisal.

By Holmes M, C Carroll C, Papaioannou D.

Romiplostim for the treatment of chronic immune or idiopathic thrombocytopenic purpura: a single technology appraisal.

By Mowatt G, Boachie C, Crowther M, Fraser C, Hernández R, Jia X, *et al.*

Sunitinib for the treatment of gastrointestinal stromal tumours: a critique of the submission from Pfizer.

By Bond M, Hoyle M, Moxham T, Napier M, Anderson R.

No. 45

Vitamin K to prevent fractures in older women: systematic review and economic evaluation.

By Stevenson M, Lloyd-Jones M, Papaioannou D.

No. 46

The effects of biofeedback for the treatment of essential hypertension: a systematic review.

By Greenhalgh J, Dickson R, Dundar Y.

No. 47

A randomised controlled trial of the use of aciclovir and/or prednisolone for the early treatment of Bell's palsy: the BELLS study.

By Sullivan FM, Swan IRC, Donnan PT, Morrison JM, Smith BH, McKinstry B, *et al.*

Suppl. 3

Lapatinib for the treatment of HER2-overexpressing breast cancer.

By Jones J, Takeda A, Picot J, von Keyserlingk C, Clegg A.

Infliximab for the treatment of ulcerative colitis.

By Hyde C, Bryan S, Juarez-Garcia A, Andronis L, Fry-Smith A.

Rimonabant for the treatment of overweight and obese people.

By Burch J, McKenna C, Palmer S, Norman G, Glanville J, Sculpher M, *et al.*

Telbivudine for the treatment of chronic hepatitis B infection.

By Hartwell D, Jones J, Harris P, Cooper K.

Entecavir for the treatment of chronic hepatitis B infection.

By Shepherd J, Gospodarevskaya E, Frampton G, Cooper K.

Febuxostat for the treatment of hyperuricaemia in people with gout: a single technology appraisal.

By Stevenson M, Pandor A.

Rivaroxaban for the prevention of venous thromboembolism: a single technology appraisal.

By Stevenson M, Scope A, Holmes M, Rees A, Kaltenthaler E.

Cetuximab for the treatment of recurrent and/or metastatic squamous cell carcinoma of the head and neck.

By Greenhalgh J, Bagust A, Boland A, Fleeman N, McLeod C, Dundar Y, *et al.*

Mifamurtide for the treatment of osteosarcoma: a single technology appraisal.

By Pandor A, Fitzgerald P, Stevenson M, Papaioannou D.

Ustekinumab for the treatment of moderate to severe psoriasis.

By Gospodarevskaya E, Picot J, Cooper K, Loveman E, Takeda A.

No. 48

Endovascular stents for abdominal aortic aneurysms: a systematic review and economic model.

By Chambers D, Epstein D, Walker S, Fayer D, Paton F, Wright K, *et al.*

No. 49

Clinical and cost-effectiveness of epoprostenol, iloprost, bosentan, sitaxentan and sildenafil for pulmonary arterial hypertension within their licensed indications: a systematic review and economic evaluation.

By Chen Y-F, Jowett S, Barton P, Malotki K, Hyde C, Gibbs JSR, *et al.*

No. 50

Cessation of attention deficit hyperactivity disorder drugs in the young (CADDY) – a pharmacoepidemiological and qualitative study.

By Wong ICK, Asherson P, Bilbow A, Clifford S, Coghill D, R DeSoysa R, *et al.*

No. 51

ARTISTIC: a randomised trial of human papillomavirus (HPV) testing in primary cervical screening.

By Kitchener HC, Almonte M, Gilham C, Dowie R, Stoykova B, Sargent A, *et al.*

No. 52

The clinical effectiveness of glucosamine and chondroitin supplements in slowing or arresting progression of osteoarthritis of the knee: a systematic review and economic evaluation.

By Black C, Clar C, Henderson R, MacEachern C, McNamee P, Quayyum Z, *et al.*

No. 53

Randomised preference trial of medical versus surgical termination of pregnancy less than 14 weeks' gestation (TOPS).

By Robson SC, Kelly T, Howel D, Deverill M, Hewison J, Lie MLS, *et al.*

No. 54

Randomised controlled trial of the use of three dressing preparations in the management of chronic ulceration of the foot in diabetes.

By Jeffcoate WJ, Price PE, Phillips CJ, Game FL, Mudge E, Davies S, *et al.*

No. 55

VenUS II: a randomised controlled trial of larval therapy in the management of leg ulcers.

By Dumville JC, Worthy G, Soares MO, Bland JM, Cullum N, Dowson C, *et al.*

No. 56

A prospective randomised controlled trial and economic modelling of antimicrobial silver dressings versus non-adherent control dressings for venous leg ulcers: the VULCAN trial

By Michaels JA, Campbell WB, King BM, MacIntyre J, Palfreyman SJ, Shackley P, *et al.*



Health Technology Assessment programme

Director,
Professor Tom Walley,
Director, NIHR HTA
programme, Professor of
Clinical Pharmacology,
University of Liverpool

Deputy Director,
Professor Jon Nicholl,
Director, Medical Care Research
Unit, University of Sheffield

Prioritisation Strategy Group

Members

Chair,
Professor Tom Walley,
Director, NIHR HTA
programme, Professor of
Clinical Pharmacology,
University of Liverpool

Deputy Chair,
Professor Jon Nicholl,
Director, Medical Care Research
Unit, University of Sheffield

Dr Bob Coates,
Consultant Advisor, NETSCC,
HTA

Dr Andrew Cook,
Consultant Advisor, NETSCC,
HTA

Dr Peter Davidson,
Director of Science Support,
NETSCC, HTA

Professor Robin E Ferner,
Consultant Physician and
Director, West Midlands Centre
for Adverse Drug Reactions,
City Hospital NHS Trust,
Birmingham

Professor Paul Glasziou,
Professor of Evidence-Based
Medicine, University of Oxford

Dr Nick Hicks,
Director of NHS Support,
NETSCC, HTA

Dr Edmund Jessop,
Medical Adviser, National
Specialist, National
Commissioning Group (NCG),
Department of Health, London

Ms Lynn Kerridge,
Chief Executive Officer,
NETSCC and NETSCC, HTA

Dr Ruairidh Milne,
Director of Strategy and
Development, NETSCC

Ms Kay Pattison,
Section Head, NHS R&D
Programme, Department of
Health

Ms Pamela Young,
Specialist Programme Manager,
NETSCC, HTA

HTA Commissioning Board

Members

Programme Director,
Professor Tom Walley,
Director, NIHR HTA
programme, Professor of
Clinical Pharmacology,
University of Liverpool

Chair,
Professor Jon Nicholl,
Director, Medical Care Research
Unit, University of Sheffield

Deputy Chair,
Dr Andrew Farmer,
Senior Lecturer in General
Practice, Department of
Primary Health Care,
University of Oxford

Professor Ann Ashburn,
Professor of Rehabilitation
and Head of Research,
Southampton General Hospital

Professor Deborah Ashby,
Professor of Medical Statistics,
Queen Mary, University of
London

Professor John Cairns,
Professor of Health Economics,
London School of Hygiene and
Tropical Medicine

Professor Peter Croft,
Director of Primary Care
Sciences Research Centre, Keele
University

Professor Nicky Cullum,
Director of Centre for Evidence-
Based Nursing, University of
York

Professor Jenny Donovan,
Professor of Social Medicine,
University of Bristol

Professor Steve Halligan,
Professor of Gastrointestinal
Radiology, University College
Hospital, London

Professor Freddie Hamdy,
Professor of Urology,
University of Sheffield

Professor Allan House,
Professor of Liaison Psychiatry,
University of Leeds

Dr Martin J Landray,
Reader in Epidemiology,
Honorary Consultant Physician,
Clinical Trial Service Unit,
University of Oxford

Professor Stuart Logan,
Director of Health & Social
Care Research, The Peninsula
Medical School, Universities of
Exeter and Plymouth

Dr Rafael Perera,
Lecturer in Medical Statistics,
Department of Primary Health
Care, University of Oxford

Professor Ian Roberts,
Professor of Epidemiology &
Public Health, London School
of Hygiene and Tropical
Medicine

Professor Mark Sculpher,
Professor of Health Economics,
University of York

Professor Helen Smith,
Professor of Primary Care,
University of Brighton

Professor Kate Thomas,
Professor of Complementary &
Alternative Medicine Research,
University of Leeds

Professor David John
Torgerson,
Director of York Trials Unit,
University of York

Professor Hywel Williams,
Professor of Dermato-
Epidemiology, University of
Nottingham

Observers

Ms Kay Pattison,
Section Head, NHS R&D
Programme, Department of
Health

Dr Morven Roberts,
Clinical Trials Manager,
Medical Research Council

Diagnostic Technologies & Screening Panel

Members

Chair,
Professor Paul Glasziou,
Professor of Evidence-Based
Medicine, University of Oxford

Deputy Chair,
Dr David Elliman,
Consultant Paediatrician and
Honorary Senior Lecturer,
Great Ormond Street Hospital,
London

Professor Judith E Adams,
Consultant Radiologist,
Manchester Royal Infirmary,
Central Manchester &
Manchester Children's
University Hospitals NHS Trust,
and Professor of Diagnostic
Radiology, Imaging Science
and Biomedical Engineering,
Cancer & Imaging Sciences,
University of Manchester

Ms Jane Bates,
Consultant Ultrasound
Practitioner, Ultrasound
Department, Leeds Teaching
Hospital NHS Trust

Dr Stephanie Dancer,
Consultant Microbiologist,
Hairmyres Hospital, East
Kilbride

Professor Glyn Elwyn,
Primary Medical Care Research
Group, Swansea Clinical School,
University of Wales

Dr Ron Gray,
Consultant Clinical
Epidemiologist, Department
of Public Health, University of
Oxford

Professor Paul D Griffiths,
Professor of Radiology,
University of Sheffield

Dr Jennifer J Kurinczuk,
Consultant Clinical
Epidemiologist, National
Perinatal Epidemiology Unit,
Oxford

Dr Susanne M Ludgate,
Medical Director, Medicines &
Healthcare Products Regulatory
Agency, London

Dr Anne Mackie,
Director of Programmes, UK
National Screening Committee

Dr Michael Millar,
Consultant Senior Lecturer in
Microbiology, Barts and The
London NHS Trust, Royal
London Hospital

Mr Stephen Pilling,
Director, Centre for Outcomes,
Research & Effectiveness,
Joint Director, National
Collaborating Centre for
Mental Health, University
College London

Mrs Una Rennard,
Service User Representative

Dr Phil Shackley,
Senior Lecturer in Health
Economics, School of
Population and Health
Sciences, University of
Newcastle upon Tyne

Dr W Stuart A Smellie,
Consultant in Chemical
Pathology, Bishop Auckland
General Hospital

Dr Nicholas Summerton,
Consultant Clinical and Public
Health Advisor, NICE

Ms Dawn Talbot,
Service User Representative

Dr Graham Taylor,
Scientific Advisor, Regional
DNA Laboratory, St James's
University Hospital, Leeds

Professor Lindsay Wilson
Turnbull,
Scientific Director of the
Centre for Magnetic Resonance
Investigations and YCR
Professor of Radiology, Hull
Royal Infirmary

Observers

Dr Tim Elliott,
Team Leader, Cancer
Screening, Department of
Health

Dr Catherine Moody,
Programme Manager,
Neuroscience and Mental
Health Board

Dr Ursula Wells,
Principal Research Officer,
Department of Health

Pharmaceuticals Panel

Members

Chair,
Professor Robin Ferner,
Consultant Physician and
Director, West Midlands Centre
for Adverse Drug Reactions,
City Hospital NHS Trust,
Birmingham

Deputy Chair,
Professor Imti Choonara,
Professor in Child Health,
University of Nottingham

Mrs Nicola Carey,
Senior Research Fellow,
School of Health and Social
Care, The University of
Reading

Mr John Chapman,
Service User Representative

Dr Peter Elton,
Director of Public Health,
Bury Primary Care Trust

Dr Ben Goldacre,
Research Fellow, Division of
Psychological Medicine and
Psychiatry, King's College
London

Mrs Barbara Greggains,
Service User Representative

Dr Bill Gutteridge,
Medical Adviser, London
Strategic Health Authority

Dr Dyfrig Hughes,
Reader in Pharmacoeconomics
and Deputy Director, Centre
for Economics and Policy in
Health, IMSCaR, Bangor
University

Professor Jonathan Ledermann,
Professor of Medical Oncology
and Director of the Cancer
Research UK and University
College London Cancer Trials
Centre

Dr Yoon K Loke,
Senior Lecturer in Clinical
Pharmacology, University of
East Anglia

Professor Femi Oyeboode,
Consultant Psychiatrist
and Head of Department,
University of Birmingham

Dr Andrew Prentice,
Senior Lecturer and Consultant
Obstetrician and Gynaecologist,
The Rosie Hospital, University
of Cambridge

Dr Martin Shelly,
General Practitioner, Leeds,
and Associate Director, NHS
Clinical Governance Support
Team, Leicester

Dr Gillian Shepherd,
Director, Health and Clinical
Excellence, Merck Serono Ltd

Mrs Katrina Simister,
Assistant Director New
Medicines, National Prescribing
Centre, Liverpool

Mr David Symes,
Service User Representative

Dr Lesley Wise,
Unit Manager,
Pharmacoepidemiology
Research Unit, VRMM,
Medicines & Healthcare
Products Regulatory Agency

Observers

Ms Kay Pattison,
Section Head, NHS R&D
Programme, Department of
Health

Mr Simon Reeve,
Head of Clinical and Cost-
Effectiveness, Medicines,
Pharmacy and Industry Group,
Department of Health

Dr Heike Weber,
Programme Manager,
Medical Research Council

Dr Ursula Wells,
Principal Research Officer,
Department of Health

Therapeutic Procedures Panel

Members

Chair,

Dr John C Pounsford,
Consultant Physician, North
Bristol NHS Trust

Deputy Chair,

Professor Scott Weich,
Professor of Psychiatry, Division
of Health in the Community,
University of Warwick,
Coventry

Professor Jane Barlow,
Professor of Public Health in
the Early Years, Health Sciences
Research Institute, Warwick
Medical School, Coventry

Ms Maree Barnett,
Acting Branch Head of Vascular
Programme, Department of
Health

Mrs Val Carlill,
Service User Representative

Mrs Anthea De Barton-Watson,
Service User Representative

Mr Mark Emberton,
Senior Lecturer in Oncological
Urology, Institute of Urology,
University College Hospital,
London

Professor Steve Goodacre,
Professor of Emergency
Medicine, University of
Sheffield

Professor Christopher Griffiths,
Professor of Primary Care, Barts
and The London School of
Medicine and Dentistry

Mr Paul Hilton,
Consultant Gynaecologist
and Urogynaecologist, Royal
Victoria Infirmary, Newcastle
upon Tyne

Professor Nicholas James,
Professor of Clinical Oncology,
University of Birmingham,
and Consultant in Clinical
Oncology, Queen Elizabeth
Hospital

Dr Peter Martin,
Consultant Neurologist,
Addenbrooke's Hospital,
Cambridge

Dr Kate Radford,
Senior Lecturer (Research),
Clinical Practice Research
Unit, University of Central
Lancashire, Preston

Mr Jim Reece
Service User Representative

Dr Karen Roberts,
Nurse Consultant, Dunston Hill
Hospital Cottages

Observers

Dr Phillip Leech,
Principal Medical Officer for
Primary Care, Department of
Health

Ms Kay Pattison,
Section Head, NHS R&D
Programme, Department of
Health

Dr Morven Roberts,
Clinical Trials Manager,
Medical Research Council

Professor Tom Walley,
Director, NIHR HTA
programme, Professor of
Clinical Pharmacology,
University of Liverpool

Dr Ursula Wells,
Principal Research Officer,
Department of Health

Disease Prevention Panel

Members

Chair,

Dr Edmund Jessop,
Medical Adviser, National
Specialist, National
Commissioning Group (NCG),
London

Deputy Chair,

Dr David Pencheon,
Director, NHS Sustainable
Development Unit, Cambridge

Dr Elizabeth Fellow-Smith,
Medical Director, West London
Mental Health Trust, Middlesex

Dr John Jackson,
General Practitioner, Parkway
Medical Centre, Newcastle
upon Tyne

Professor Mike Kelly,
Director, Centre for Public
Health Excellence, NICE,
London

Dr Chris McCall,
General Practitioner, The
Hadleigh Practice, Corfe
Mullen, Dorset

Ms Jeanett Martin,
Director of Nursing, BarnDoc
Limited, Lewisham Primary
Care Trust

Dr Julie Mytton,
Locum Consultant in Public
Health Medicine, Bristol
Primary Care Trust

Miss Nicky Mullany,
Service User Representative

Professor Ian Roberts,
Professor of Epidemiology and
Public Health, London School
of Hygiene & Tropical Medicine

Professor Ken Stein,
Senior Clinical Lecturer in
Public Health, University of
Exeter

Dr Kieran Sweeney,
Honorary Clinical Senior
Lecturer, Peninsula College
of Medicine and Dentistry,
Universities of Exeter and
Plymouth

Professor Carol Tannahill,
Glasgow Centre for Population
Health

Professor Margaret Thorogood,
Professor of Epidemiology,
University of Warwick Medical
School, Coventry

Observers

Ms Christine McGuire,
Research & Development,
Department of Health

Dr Caroline Stone,
Programme Manager, Medical
Research Council

Expert Advisory Network

Members

Professor Douglas Altman,
Professor of Statistics in
Medicine, Centre for Statistics
in Medicine, University of
Oxford

Professor John Bond,
Professor of Social Gerontology
& Health Services Research,
University of Newcastle upon
Tyne

Professor Andrew Bradbury,
Professor of Vascular Surgery,
Solihull Hospital, Birmingham

Mr Shaun Brogan,
Chief Executive, Ridgeway
Primary Care Group, Aylesbury

Mrs Stella Burnside OBE,
Chief Executive, Regulation
and Improvement Authority,
Belfast

Ms Tracy Bury,
Project Manager, World
Confederation for Physical
Therapy, London

Professor Iain T Cameron,
Professor of Obstetrics and
Gynaecology and Head of the
School of Medicine, University
of Southampton

Dr Christine Clark,
Medical Writer and Consultant
Pharmacist, Rossendale

Professor Collette Clifford,
Professor of Nursing and
Head of Research, The
Medical School, University of
Birmingham

Professor Barry Cookson,
Director, Laboratory of Hospital
Infection, Public Health
Laboratory Service, London

Dr Carl Counsell,
Clinical Senior Lecturer in
Neurology, University of
Aberdeen

Professor Howard Cuckle,
Professor of Reproductive
Epidemiology, Department
of Paediatrics, Obstetrics &
Gynaecology, University of
Leeds

Dr Katherine Darton,
Information Unit, MIND – The
Mental Health Charity, London

Professor Carol Dezateux,
Professor of Paediatric
Epidemiology, Institute of Child
Health, London

Mr John Dunning,
Consultant Cardiothoracic
Surgeon, Papworth Hospital
NHS Trust, Cambridge

Mr Jonathan Earnshaw,
Consultant Vascular Surgeon,
Gloucestershire Royal Hospital,
Gloucester

Professor Martin Eccles,
Professor of Clinical
Effectiveness, Centre for Health
Services Research, University of
Newcastle upon Tyne

Professor Pam Enderby,
Dean of Faculty of Medicine,
Institute of General Practice
and Primary Care, University of
Sheffield

Professor Gene Feder,
Professor of Primary Care
Research & Development,
Centre for Health Sciences,
Barts and The London School
of Medicine and Dentistry

Mr Leonard R Fenwick,
Chief Executive, Freeman
Hospital, Newcastle upon Tyne

Mrs Gillian Fletcher,
Antenatal Teacher and Tutor
and President, National
Childbirth Trust, Henfield

Professor Jayne Franklyn,
Professor of Medicine,
University of Birmingham

Mr Tam Fry,
Honorary Chairman, Child
Growth Foundation, London

Professor Fiona Gilbert,
Consultant Radiologist and
NCRN Member, University of
Aberdeen

Professor Paul Gregg,
Professor of Orthopaedic
Surgical Science, South Tees
Hospital NHS Trust

Bec Hanley,
Co-director, TwoCan Associates,
West Sussex

Dr Maryann L Hardy,
Senior Lecturer, University of
Bradford

Mrs Sharon Hart,
Healthcare Management
Consultant, Reading

Professor Robert E Hawkins,
CRC Professor and Director
of Medical Oncology, Christie
CRC Research Centre,
Christie Hospital NHS Trust,
Manchester

Professor Richard Hobbs,
Head of Department of Primary
Care & General Practice,
University of Birmingham

Professor Alan Horwich,
Dean and Section Chairman,
The Institute of Cancer
Research, London

Professor Allen Hutchinson,
Director of Public Health and
Deputy Dean of SchARR,
University of Sheffield

Professor Peter Jones,
Professor of Psychiatry,
University of Cambridge,
Cambridge

Professor Stan Kaye,
Cancer Research UK Professor
of Medical Oncology, Royal
Marsden Hospital and Institute
of Cancer Research, Surrey

Dr Duncan Keeley,
General Practitioner (Dr Burch
& Ptnrs), The Health Centre,
Thame

Dr Donna Lamping,
Research Degrees Programme
Director and Reader in
Psychology, Health Services
Research Unit, London School
of Hygiene and Tropical
Medicine, London

Mr George Levvy,
Chief Executive, Motor
Neurone Disease Association,
Northampton

Professor James Lindesay,
Professor of Psychiatry for the
Elderly, University of Leicester

Professor Julian Little,
Professor of Human Genome
Epidemiology, University of
Ottawa

Professor Alistaire McGuire,
Professor of Health Economics,
London School of Economics

Professor Rajan Madhok,
Medical Director and Director
of Public Health, Directorate
of Clinical Strategy & Public
Health, North & East Yorkshire
& Northern Lincolnshire
Health Authority, York

Professor Alexander Markham,
Director, Molecular Medicine
Unit, St James's University
Hospital, Leeds

Dr Peter Moore,
Freelance Science Writer,
Ashtead

Dr Andrew Mortimore,
Public Health Director,
Southampton City Primary
Care Trust

Dr Sue Moss,
Associate Director, Cancer
Screening Evaluation Unit,
Institute of Cancer Research,
Sutton

Professor Miranda Mugford,
Professor of Health Economics
and Group Co-ordinator,
University of East Anglia

Professor Jim Neilson,
Head of School of Reproductive
& Developmental Medicine
and Professor of Obstetrics
and Gynaecology, University of
Liverpool

Mrs Julietta Patnick,
National Co-ordinator, NHS
Cancer Screening Programmes,
Sheffield

Professor Robert Peveler,
Professor of Liaison Psychiatry,
Royal South Hants Hospital,
Southampton

Professor Chris Price,
Director of Clinical Research,
Bayer Diagnostics Europe,
Stoke Poges

Professor William Rosenberg,
Professor of Hepatology
and Consultant Physician,
University of Southampton

Professor Peter Sandercock,
Professor of Medical Neurology,
Department of Clinical
Neurosciences, University of
Edinburgh

Dr Susan Schonfield,
Consultant in Public Health,
Hillingdon Primary Care Trust,
Middlesex

Dr Eamonn Sheridan,
Consultant in Clinical Genetics,
St James's University Hospital,
Leeds

Dr Margaret Somerville,
Director of Public Health
Learning, Peninsula Medical
School, University of Plymouth

Professor Sarah Stewart-Brown,
Professor of Public Health,
Division of Health in the
Community, University of
Warwick, Coventry

Professor Ala Szczepura,
Professor of Health Service
Research, Centre for Health
Services Studies, University of
Warwick, Coventry

Mrs Joan Webster,
Consumer Member, Southern
Derbyshire Community Health
Council

Professor Martin Whittle,
Clinical Co-director, National
Co-ordinating Centre for
Women's and Children's
Health, Lymington

Feedback

The HTA programme and the authors would like to know your views about this report.

The Correspondence Page on the HTA website (www.hta.ac.uk) is a convenient way to publish your comments. If you prefer, you can send your comments to the address below, telling us whether you would like us to transfer them to the website.

We look forward to hearing from you.