

## **Clinical medication review by a pharmacist of patients on repeat prescriptions in general practice: a randomised controlled trial**

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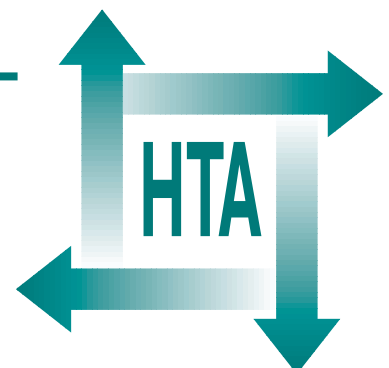
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**Health Technology Assessment  
NHS R&D HTA Programme**





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Initially, six HTA panels (pharmaceuticals, acute sector, primary and community care, diagnostics and imaging, population screening, methodology) helped to set the research priorities for the HTA Programme. However, during the past few years there have been a number of changes in and around NHS R&D, such as the establishment of the National Institute for Clinical Excellence (NICE) and the creation of three new research programmes: Service Delivery and Organisation (SDO); New and Emerging Applications of Technology (NEAT); and the Methodology Programme.

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## List of abbreviations

ACE	angiotensin-converting enzyme
ASTRO-PU	Age, Sex and Temporary Resident Oriented- Prescribing Unit
BNF	<i>British National Formulary</i>
CI	confidence interval
CNS	central nervous system
EMIS	Egton Medical Information System
GP	general practitioner
IQR	interquartile range
NSAID	non-steroidal anti-inflammatory drug
p.r.n.	<i>pro re nata</i> (as required)
RCT	randomised controlled trial
SD	standard deviation





## Executive summary

### Objectives

To determine whether a suitably trained clinical pharmacist could conduct effective clinical medication reviews of elderly patients on repeat medication in general practice, and specifically:

- to assess whether clinical medication review by a pharmacist is a cost-effective method of improving the extent, cost and quality of clinical control of repeat prescribing compared with that achieved by a practice's normal procedures
- to evaluate the effect of medication review clinics on the number of practice consultations, outpatient consultations, hospital admissions and deaths
- to identify the types of interventions.

### Design

A randomised controlled trial of clinical medication review of elderly patients on repeat medication in general practice. The control group of patients received normal care from their practices.

### Setting and participants

Patients were eligible for inclusion in the study if they were aged 65 years or over, on at least one repeat medication, not resident in a nursing or residential home, and not terminally ill. Patients were also excluded if specifically requested by the general practitioner (GP). Patients were recruited from four general practices in Leeds. The practices were eligible if they had four or more partners, were computerised, had close to average prescribing costs in the previous year, and had no previous or current input from a clinical pharmacist.

### Intervention

Patients in the intervention group were invited for a consultation with the pharmacist at the surgery. The pharmacist assessed the patient, the illnesses and the medication regimen, and made recommendations.

### Main outcome measures

The primary outcome was the number of repeat medication changes per patient over a 12-month period. The secondary outcome was the effect on the medication costs. The intervention group was compared with the control group to see whether a review had taken place, the numbers of medication changes, the numbers of repeat medications and the numbers of dosage times. The effects of the medication review clinics were considered in relation to practice consultations, outpatient consultations, hospital admissions and deaths from any cause. The number and nature of the pharmacist's interventions and recommendations were recorded, together with whether the recommendations were accepted by the GP.

### Results

The mean numbers of individual medication changes per patient were 2.2 in the intervention group and 1.9 in the control group: difference = 0.31 (95% confidence interval (CI), 0.06 to 0.57);  $p = 0.02$ . The numbers of repeat medication items rose in both groups but the rise was significantly less in the intervention group (intervention mean 0.2, standard deviation (SD) 1.55; control mean 0.4, SD 1.53; group difference  $-0.2$ , 95% CI,  $-0.4$  to  $-0.1$ ). Medication costs rose in both groups but the rise was significantly less in the intervention group (intervention mean £1.80, control mean £6.53, group difference  $-\text{£}4.72$  (95% CI,  $-7.04$  to  $-2.41$ ). The cost saving on medication in the intervention group compared with the control group was £4.75 per 28-day month. Extrapolated for 1 year, this is a saving of £61.75 per patient. There was no evidence of a difference between the groups for the numbers of outpatient consultations, hospital admissions or practice consultations over the 12-month period. There were fewer deaths in the intervention group (15 deaths, 2.5%) than in the control group (25 deaths, 4.3%) but the difference did not reach statistical significance ( $p = 0.56$ ).

Over the 12-month study period, 97% of the intervention group had medication reviews compared with 44% in the control group.

A recommendation was made in 258 of the 591 (44%) patient consultations. Only 28 patients (5%) needed referral to a GP and 25 patients (4%) needed referral for a test. The pharmacist dealt with all other medication-related problems. A recommendation was made for 603 of the 2927 repeat medications (21%). The most common recommendations were 'stop the medicine' (118 medicines, 4% of all medicines) and 'technical', for example, a generic switch or removal of a 'redundant item' from repeat list (177, 6%). Of the 603 medication interventions, 395 (65%) were dealt with by the pharmacist alone, without reference to a GP. Recommendations were made to and permission was sought from the GPs for 208 interventions (34%). The pharmacist's advice was accepted and acted upon in 179 instances (86%).

## Conclusions

A suitably trained pharmacist can conduct consultations with elderly patients to review them, their medicines and the conditions for which they

were prescribed. This intervention resulted in a greater coverage of medication review and more interventions than if the pharmacist was not involved. The pharmacist's interventions led to reductions in the number of drugs taken by the intervention group compared with the control group, and thus to major net financial savings. There was no evidence of an adverse effect on subsequent use of health services.

Although the study demonstrates the potential of this extended role for the pharmacist, its reproducibility as a service modality needs to be tested further. Only one, very experienced, pharmacist was involved, working in four selected Leeds practices. It is important to reproduce the results with more pharmacists working in large numbers of practices over a wider geographical and socio-economic area before making fundamental changes to the service and the everyday role of the pharmacist. Nonetheless, it is not unreasonable to predict that clinical medication review will become a core role of the pharmacist and will achieve therapeutic benefits combined with neutral cost implications.

# Chapter I

## Introduction

### Repeat prescribing

Repeat prescribing by general practitioners (GPs) is an accepted part of practice in the UK. It allows patients to obtain continuing supplies of long-term medication without having to see their GP every time. GPs use their professional discretion to decide when and how often to review a patient. Reviewing all patients whenever a repeat medication is required would be impractical and wasteful of both the doctors' and patients' time. The repeat prescription process that has evolved in the UK is a pragmatic way of dealing with the burgeoning workload of providing continuing medication. It provides a compromise between seeing the patient for each prescription (thus creating an impossible workload) and issuing prescriptions for a year's medication (which might be wasteful or hazardous).

### Defining repeat prescribing

The very great increase in the number of repeat prescriptions over the last 20 years has been driven by a number of social and medical factors. The use of computers to process repeats, now nearly universal practice, has been an inevitable outcome of the need to produce rapid, accurate and safe prescriptions on demand for large numbers of patients.<sup>1</sup> Harris and Dadja<sup>2</sup> concluded that reference to computer generation of such prescriptions was an important part of the definition and defined a repeat prescription as "one that is printed by a practice computer from its repeat prescribing programme within a given period." This definition was derived for a specific purpose; it is simple and practical, and allows comparison between practices and between studies.

### The scale of repeat prescribing

In early work it was suggested that between 25% and 50% of prescriptions generated by GPs were repeats.<sup>3,4</sup> A literature review conducted in 1982<sup>5</sup> placed this figure at between 12.5% and 33%. Studies conducted in single practices in the 1980s concluded that the rates were 36%,<sup>6</sup> 30%<sup>7</sup> and 50%.<sup>8</sup> In a study of 96 GPs, the repeat prescription rate was 41.9%.<sup>9</sup> However, these values were all

derived before the widespread introduction of computers in practices. The data were collected manually and there are doubts about whether all non-acute prescription data were collected.<sup>2</sup> The lack of a common definition of repeat prescribing in previous studies makes it impossible to determine the rate of growth with any certainty. The waters are further muddied by the question of prescription duration. There has been a palpable (though unfortunately not documented) trend from 1-month to 2-month and even 3-month prescriptions. This will reduce the number of items prescribed without in any way altering the number of medicines consumed by each patient and may, therefore, lead to a sizeable underestimate of the magnitude of repeat prescribing. For this reason, costs rather than individual items may be a better indicator of the scale of repeat prescribing.

More recently, three pieces of work have produced values for current repeat prescribing rates and costs. The Sowerby Centre for Health Informatics<sup>10</sup> used data from the computer systems of two group practices in Gateshead and Newcastle to give a figure of 66.4% of items prescribed and 79% of costs. Further (unpublished) work by the Sowerby Centre in seven practices gave a figure of 65% of items prescribed and 75% of costs. Harris and Dadja<sup>2</sup> looked at patients as well as items and costs, and described how the percentage of prescription items that were repeats rose from about 50% in patients aged 15–34 years to 90% for those aged 85 years and over. The study looked at data over 4 years (1991–94) and gave the most thorough overview of the rates, patterns and costs of repeat prescribing in England. The percentage of repeats (by item and cost) over the 4-year period are shown in *Table 1*, which illustrates that both costs and volumes of prescribed medicines are rising each year.

The numbers of repeat prescriptions continue to grow for several reasons.

### Increases in the number of effective drugs

Over recent decades the number of newly licensed drugs has increased dramatically. Manufacturers have developed new compounds to improve further the treatment of disease and even

**TABLE 1** Repeat prescriptions: percentage of total items and cost annually, 1991–August 1994<sup>2</sup>

Year	Items		Costs	
	Total number (millions)	Repeats (%)	Total, £ (millions)	Repeats (%)
1991	4.26	75.30	24.45	83.20
1992	5.06	75.51	32.83	81.83
1993	5.82	74.77	40.84	80.71
1994 (January to August only)	3.81	76.16	28.75	81.72

for the treatment of hitherto untreatable disease. Examples are angiotensin-converting enzyme (ACE) inhibitors, proton pump inhibitors, lipid-lowering drugs and novel anticonvulsant medications.

### Increase in the evidence base

Evidence from large, long-term, randomised controlled trials (RCTs) confirming beneficial outcomes from the use of existing therapies has also increased. This has led to large increases in the prescribing of drugs for hypertension, statins for hyperlipidaemia, aspirin in heart disease and alpha-adrenergic blockers in prostatic disease.

### Guidelines and formularies

National Service Frameworks and guidelines from the National Institute for Clinical Excellence have clarified the approach to managing chronic diseases such as coronary heart disease. The synthesis of existing data into government-approved publications has placed an expectation on general practices to ensure that all patients with chronic diseases are identified and managed appropriately, often with long-term drug therapy. Many primary care organisations also produce their own guidelines and formularies.

### Life-style drugs

So-called ‘life-style drugs’ (such as sildenafil for the treatment of erectile dysfunction, bupropion for smoking cessation and orlistat for obesity) have been developed. It can be argued that drugs such as proton pump inhibitors are also life-style drugs (especially when used, as they often are, outside their licensed indication<sup>11</sup>), because patients continue with a life-style that contributes to the symptoms – in this example, obesity and inappropriate diet. Again, these types of drugs are often prescribed for long-term use.

### More screening for chronic disease

More patients with chronic disease and risk factors for it are being diagnosed and identified by

screening; the medical response is often a long-term prescription.

### Increase in the age of the population

Elderly patients consume a disproportionate share of health resources, including medicines. Age, Sex and Temporary Resident Originated – Prescribing Units (ASTRO–PUs) give a cost-based weighting ten times higher to a patient aged 75 years compared with a patient aged 1 year.<sup>12</sup> As the elderly population in the UK increases both in numbers and age, this will inevitably lead to an increase in long-term medication usage.

### More prescribers

In the government report *Review of prescribing, supply and administration of medicines*,<sup>13</sup> an extension of prescribing rights to non-medical and non-dental healthcare professionals was recommended. Some district nurses and health visitors can now prescribe from a limited list and this was due to expand to other nursing groups in late 2001. The number of doctors has also increased. Nurse practitioners do not prescribe medication but **do** initiate medication that is prescribed by doctors. Although prescribing might appear to be a patient and illness-led phenomenon, it is inevitable that more prescribers will exert further upward pressure on prescribing.

### Therapeutic momentum

Therapeutic momentum is when a patient continues to take a redundant medicine for months or years because its continuing need has not been reviewed. The prescription is renewed by default rather than by intent. Stopping a repeat medicine requires a definite decision, and may require a further consultation to evaluate the effect of withdrawal. The patient’s condition may even deteriorate, requiring further intervention, sometimes including restarting the medicine. There is a palpable risk.

There is also a risk in **not** stopping a medicine but it is less palpable. Adverse effects may be subtle and not recognised as such. There may be a cumulative toxic effect. There is certainly a financial cost and the unnecessary continuation of the patient's sick role cannot be ignored. Patients often collude with their doctors in continuing unnecessary medication – this generally relates to their belief in the therapeutic effect of the medicine. Balint and colleagues<sup>14</sup> also described the 'arms-length' therapeutic relationship symbolised by the repeat medication that is more comfortable for both patient and doctor than a closer one but still maintains a link. They suggested that "Repeat prescriptions are written in steel and concrete and are not easily dismantled or remodelled". It is certainly true that a medicine that no longer has a therapeutic role can only do harm.

## Review of repeat prescribing

The review of long-term prescribing is less than ideal. A report by the NHS Audit Commission commented that the frequency and thoroughness of long-term medication reviews were often inadequate.<sup>15</sup> They recommended that all drugs should be reviewed at the same time and re-authorised as appropriate. In their 1997 report, *Medication for older people*, the Royal College of Physicians concurred and emphasised the need for regular reviews.<sup>16</sup> In a more recent study, Zermansky confirmed that control of repeat prescribing is inadequate<sup>17</sup> and concluded that it is both wasteful and potentially dangerous. In his survey of 50 general practices, he found that 56% of repeat drugs showed no evidence of authorisation by a doctor and 72% showed no evidence of having been reviewed in the last 15 months. In particular, hospital-initiated drugs were likely to be authorised as repeats without clinical appraisal. Zermansky's conclusion was that many patients take tablets for years without any recorded clinical evaluation.

McGavock and colleagues<sup>18</sup> used a semi-structured questionnaire in a random sample of 57 practices in Northern Ireland to establish the quality of the repeat prescribing process and found it to be poorly managed. During the issue of repeat prescriptions, essential checks were often omitted. Computer systems were not fully utilised to aid the process of managing repeat prescriptions. At the review consultation, the opportunities for quality assurance were often missed: for example, patients were not asked if they were experiencing any potential side-effects, if they knew what the

medicine was for, or if they were taking any other medicines.

## The elderly as a risk group for iatrogenic disease

Physiological and pathological changes occur with increasing age. Physiological changes lead to alterations in capacity for homeostasis. This is important in the context of the body's ability to cope with disease and treatment. Alterations in the susceptibility of receptors may mean that elderly patients are less susceptible to the standard doses used in a younger population, for example, reduced inotropic responses to beta-1-adrenergic stimulants. Sensitivity to other drugs, such as warfarin, can be increased as a result of alterations in physiology with increasing age.

The incidence of concurrent chronic illness increases with age.<sup>19</sup> Multiple chronic disease results in elderly patients taking increasing numbers of medications. These may interact, sometimes positively, sometimes negatively. Thus patients may be more susceptible to adverse reactions.

Patients of all ages fail to take their medication in the way prescribed. However, disease and the ageing process itself often reduce a patient's ability to cope with medication: for example, arthritis affects patients' ability to open bottles and reduced vision affects patients' ability to read medication instructions. This can lead to unintentional non-compliance with medication. Moreover, diseases affecting cognitive function and mood, such as dementia or depression, reduce the patient's ability to understand and organise complicated medication regimens. However, there is no evidence to suggest that elderly patients are less willing to take medication than younger patients.

Errors in taking medication are more likely in the elderly for a number of reasons. They take more individual items (see above) and, in one study, the incidence of mistakes increased 15-fold when the number of drugs prescribed was increased from one to four.<sup>20</sup> Their social circumstances may make taking medicines more difficult – for example, an elderly patient may live alone with no-one to help with medicine administration.

Excessive use of medication in the elderly is also a common problem. Walley and Scott<sup>21</sup> identified

the following reasons for excessive and inappropriate prescribing in the elderly:

- therapeutic enthusiasm – the doctor’s response to each symptom and problem with treatment, most often drugs
- over-energetic treatment – which may lead to incremental prescribing (for example, swollen ankles caused by the use of nifedipine for hypertension may lead to the use of a diuretic, which, in turn, may lead to potassium supplements being prescribed, causing dyspepsia, and so on)
- a patient’s or relative’s demand for prescriptions (real or perceived)
- an inappropriate response to (often insoluble) non-medical problems
- unrealistic health expectations on the part of either the doctor, the patient or both
- prescribing by rule and failing to individualise treatment for older patients, including failing to take a holistic view of the patient
- inadequate review, leading to failure to discontinue drugs.

Elderly patients are clearly at particular risk of medication misadventure. *The National Service Framework for older people*<sup>22</sup> stated that between 5% and 17% of hospital admissions for elderly patients were caused by adverse drug reactions, and specific recommendations were made about targeting the elderly for medication review as a mechanism of reducing medicine-related problems. In particular, it stated that all patients over the age of 75 years should be reviewed annually, while those taking at least four medicines should be reviewed every 6 months. However, if all patients on regular repeat prescriptions were to be reviewed by their GPs every year, the additional annual workload for each doctor would represent approximately 1 extra week’s work<sup>2</sup> – which is not a realistic proposition in the current general practice environment.

However, pharmacists have pharmacological knowledge and some have acquired consultation skills. Although they lack the breadth of pathological knowledge and clinical skills of doctors, these might not be necessary to provide what would, in effect, be a screening service to patients on apparently stable drug regimens. The role is analogous to the ophthalmic screening service provided by optometrists. Both the Audit Commission<sup>15</sup> and the Royal College of Physicians<sup>16</sup> suggested that a pharmacist might be able to help initiate a review of repeat prescribing. The NHS plan proposes new roles in the prescribing or

supply of medicine, including medication review by a pharmacist.<sup>23</sup> A number of service developments have been started by health authorities that involve pharmacists in reviewing repeat prescribing. However, there is, as yet, little evidence of the efficacy of this role.

## Clinical medication review

### Definition

Clinical medication review describes the process by which a health professional reviews a patient, his/her illnesses and the drug treatment during a consultation (see appendix 1). It involves evaluating the therapeutic efficacy of each drug and the progress of the conditions being treated. Other issues, such as compliance, actual and potential adverse effects, interactions and the patient’s understanding of the condition and its treatment, are considered as appropriate. The outcome of such a review will be a decision about the continuation, alteration or cessation of the treatment. The concept of the review being **clinical** is important. Prescription review involves making recommendations about therapy having reviewed the prescribed medication and the patient’s notes. It does not, however, involve seeing the patient and thus can lead to important information being missed. Clinical medication review involves listening to the patient and asking questions about the illness and the medications being taken (both prescribed and non-prescribed). This yields vital information about what the patient actually takes and how they respond to it, whether they adhere to their medicine regimen, whether their condition is worsening or improving, and whether there are any unrecognised medical needs. It is also desirable to achieve agreement with the patient about the treatment, its administration, its purpose and its value.

A clinical medication review undertaken by another health professional is only useful if it can be undertaken without having to routinely involve the GP. If the patient needs to be referred to the GP or the GP’s permission or opinion has to be sought frequently, then the GP may as well undertake the review.

### Medication review studies

In 1995, the Department of Health funded six projects to assess the effectiveness of community pharmacists in reviewing repeat medication. These were conducted in the following health authorities: North West Anglia; Leicestershire; Isle of Wight;

South Derbyshire; Southampton and South West Hampshire, and Devon. Two of these assessments (North West Anglia and South Derbyshire) have been published as a single paper in a peer-reviewed journal.<sup>24</sup> The remaining assessments are summarised elsewhere.<sup>25</sup> The design and quality of these studies varied: some were of a qualitative design (Southampton and South West Hampshire; Leicestershire) and provided a useful insight into the attitudes of pharmacists and GPs towards running such programmes.

Three randomised controlled studies have been published. Granas and Bates<sup>26</sup> examined the effectiveness of one pharmacist working in a single practice. Patients with prescriptions with three or more repeat items were randomised to a control or intervention group. All patients were offered a domiciliary visit. Suggestions for changes in therapy were made for the intervention group. Of the 520 repeat prescriptions reviewed, drug-related problems were found in 153. Suggestions were made for 25% of the intervention group patients. Most interventions were of a technical nature (48% taken off repeat prescription, 11% increase quantity of supply). A small number were of a clinical nature, for example, 14% dose alteration. GPs implemented 82% of suggestions compared with 3.4% in the control group (through routine surgery practice).

Krska and colleagues<sup>27</sup> described the outcomes of patients seen at a pharmacist-conducted medication review clinic. The patients included in the study were aged 65 years or over, were taking four or more medicines and had at least two chronic diseases. A total of 332 patients were seen from six general practices. In all, 237 patients (71.4%) had at least one pharmaceutical risk factor predisposing them to either increased toxicity or reduced efficacy. The most common problems were potential/suspected adverse drug reactions (627; 24.2%) and monitoring issues (384; 14.8%). At 3 months, 79% of care issues had been resolved. No comparative data with controls was reported.

Mackie and colleagues<sup>28</sup> used six randomly selected practices. Patients aged 20 years or over and being prescribed at least four medicines were randomised to a control or intervention group. All patients were seen by the GP but recommendations were made to the GP for only the intervention group. So far the report of this trial has only been published as an abstract, so detail is lacking. All patients had about 2.8 care issues, of which 64% were considered to be clinical and 36% administrative (technical). Only 13% of care

issues remained unresolved in the intervention group compared with 66% in the control group. So, despite the potential for contamination of the control group, the pharmacist's review appeared to be very effective.

In the Isle of Wight Health Authority study,<sup>25</sup> community pharmacists used a standard FP10 prescription form and the pharmacy patient medication record to identify potentially hazardous drug interactions and cost savings. Reporting on drug interactions was dropped from the study at an early stage, since it was suggested that important interactions would already have been identified and acted upon. Cost-saving interventions were:

- generic substitution
- cheaper proprietary medicines
- changes in doses
- repeat items being prescribed and dispensed but not actually being used by the patient
- therapeutic substitution: for example, ramipril instead of other ACE inhibitors; rubefaciants instead of topical non-steroidal anti-inflammatory drugs (NSAIDs).

This study, like some others, concentrated on cost savings rather than improvement in quality. Although the changes recommended would have resulted in cost savings of £250,000 for the period of the study, the recommendations implemented accounted for only 20% of this sum, that is, £49,800. This was because of the reluctance of GPs to make therapeutic switches.

In the Leicestershire project,<sup>25</sup> the focus was again on using community pharmacists to screen repeat prescriptions for problems such as drug interactions, side-effects and cost-effectiveness. Although pharmacists were keen to take on this role, GPs appeared less enthusiastic. Pharmacists had difficulties in finding time to conduct the project; they also highlighted a need for additional training, especially in communication and assertiveness. General practices did not see pharmacists as a valuable resource. Many of the suggestions made by pharmacists were acted upon, and these resulted in modest cost savings, but both GPs and patients were often reluctant to make changes to existing treatments.

In a number of these studies,<sup>24,25</sup> the recommendations were of a more technical nature – for example, change to generic form of drug, change the quantity or change the dose schedule. Pharmacists running medication reviews from a pharmacy have no access to clinical records, so

these types of interventions would be expected to predominate. However, in a number of studies in which community pharmacists worked within general practices, similar results were found.<sup>26,29</sup> Goldstein and colleagues<sup>24</sup> found that 'inconsistent/inappropriate quantities', 'drugs on repeat list no longer required' and 'directions unsatisfactory' to be the most common interventions, while 'duplicate therapy', 'possibly causing a side-effect' and 'being used outside its product licence' were the least common.

In an uncontrolled study involving a practice pharmacist working in one GP practice, the aim was to evaluate the effectiveness of a pharmacist-run repeat medication clinic.<sup>30</sup> Patients prescribed six or more repeat medications were reviewed. On 2515 items prescribed to 240 patients, 845 interventions were made. The GPs accepted 91% of the recommendations. Again, the most common type of intervention was technical, that is, removal of items no longer being taken by the patient from the current medication list. Some 30% of the interventions were considered important enough to act on.

A medication review programme organised by the Lothian Health Board<sup>31</sup> was established to rationalise repeat prescribing in general practices through a multidisciplinary approach. Nine general practices were involved. Practice staff identified patients on six or more repeat prescriptions. The patients were not seen by the pharmacist. The pharmacist's recommendations were discussed with GPs at practice meetings and, if a change was considered necessary, the patient was asked to see the GP. There are two possible criticisms of this approach. First, patients were not seen directly by the pharmacist so important information could have been missed relating to,

for example, compliance and adverse effects. Second, patients still had to see the GP, so the GP did not save time by having a pharmacist's review. Some GPs did not find this process useful and pulled out of the project. Others considered that it helped to have an independent review and allowed GPs to discuss approaches to prescribing.

In a small study of 35 patients, the aim was to establish the extent to which additional care issues could be identified through access to patients' notes and a patient interview, as well as the drug history.<sup>32</sup> Of the issues identified, 46% were identified from the pharmacy patient medication record, 17% from patients' notes, and 37% were identified only after discussion with the patient. The results suggested that the patient interview is important in identifying pharmaceutical care issues. The only large-scale RCTs that included all three sources of information were those by Mackie and colleagues<sup>28</sup> and Krska and colleagues.<sup>27</sup>

Working from the isolation of a community pharmacy can also make communication with other healthcare professionals difficult. Although there was evidence that GPs supported the extended role of community pharmacists in medication reviews, a number of reservations were expressed.<sup>33</sup> Some GPs perceived a conflict of interest in reviewing and dispensing medication, since most of a pharmacist's NHS income is based on a fee per item dispensed.<sup>2</sup> Most GPs considered that community pharmacists are a good safety net (for example, in spotting incorrect doses or interactions). However, there was also a perception that pharmacists, by focusing purely on the medication, had too narrow an approach and lacked knowledge and understanding of the wider clinical and social aspects of patient care.<sup>34</sup>



# Chapter 2

## Aims and objectives

### Hypothesis

That a suitably trained pharmacist can conduct effective clinical medication reviews of patients on repeat medication in general practice, and that introducing this process into a practice improves the extent, quality and cost-effectiveness of clinical control of repeat prescribing.

### Aim

To determine whether a suitably trained clinical pharmacist could improve the control of repeat prescribing by conducting effective clinical medication reviews of elderly patients on repeat medications in general practice.

### Objectives

- To assess whether a clinical medication review by a pharmacist is a cost-effective method of

improving the extent, cost and quality of clinical control of repeat prescribing, compared with that achieved by a practice's normal procedures.

- To evaluate the effect of medication review clinics on the number of practice consultations, outpatient consultations, hospital admissions and deaths.
- To identify the types of interventions that were made and the acceptance of these by patients and GPs.

The primary outcome was the number of repeat medication changes per patient over a 12-month period. The secondary outcome was the effect of the intervention on medication costs.



# Chapter 3

## Method

### Practice selection

The Leeds Health Authority provided a list of practices that had four or more partners, a computerised prescribing system and no previous or current pharmacist's involvement. Practices with prescribing costs at the extreme ends of the range of all Leeds practices were excluded. Costs were obtained using cost/ASTRO-PU.<sup>12</sup> The aim was to use typical practices and not those at either extreme who may have been under-prescribing (e.g. not managing chronic disease well) or over-prescribing (e.g. prescribing unnecessary or expensive agents). ASTRO-PUs explain about 45% of the prescribing cost variation between practices.<sup>35</sup> The remaining 55% is made up of other variables, such as doctor and patient behaviour and deprivation. The effect of these variables cannot yet be quantified.

Current pharmacist involvement was defined as a community or practice-employed pharmacist providing any form of prescribing support to the practice, such as formulary development, PACT (Prescribing Analysis and CosT) data from the NHS Prescription Pricing Authority, education sessions, medication review or therapeutic switching. The list of eligible practices was put into random order and the practices were approached serially until four had been recruited.

Each practice was provided with written details of the study and the practice's expected commitment. The study pharmacist made an introductory visit to interested practices to ensure that the partners and practice staff understood the study and were still happy to participate.

### Study pharmacist

The criterion for selection of the study pharmacist was either a hospital Grade D clinical pharmacist (with clinical pharmacy responsibility for a speciality or clinical directorate), or a community-based pharmacist whose roles included prescribing data review and analysis, protocol development and medicines management clinics, or the provision of high levels of clinical services within the pharmacy and to local GPs' surgeries.

The pharmacist needed to have a postgraduate qualification at diploma level or above that related to the skills required for performing clinical pharmacy work with patients, and also needed to be able to demonstrate good inter-professional and patient communications skills. An understanding of general practice was also desirable but not essential. Since primary-care pharmacy was, at the beginning of this study, at an early stage of development, finding a candidate with general practice medication review skills seemed unlikely.

### Selection of patients

The sample size was based on a previous study that provided data on the number of changes relating to repeat medication and medication costs.<sup>36</sup> The proportion of patients in that study in whom at least one medication change took place over a 3-month period was 44% in the intervention group versus < 5% in the control group. The differences in costs for these two groups were, respectively, £422 and £398 per annum.

In order to have 80% power to detect the above differences in costs at the 5% level, 520 patients per group were required. This would allow more than 90% power to detect a difference in medication changes.

Allowing for some loss to follow-up through moving away or death, a sample size of 600 patients per group was targeted.

Participating practices were asked to provide a list of all patients aged 65 years and over who were registered with the practices in May 1999. These lists were produced from the practice computers.

Patients who were resident in a nursing or residential home, had terminal illnesses or were involved in another clinical trial were excluded. Nursing and residential home patients were excluded because their medication is in the control of professional carers (for example, nurses, managers and, in some instances, pharmacists). Terminally ill patients were excluded because their medication would be under constant review and thus they would have no need of review of long-

term treatments. It was also considered important to avoid inconveniencing these patients through involvement in the trial. Patients in other clinical trials were also likely to be under regular review and might not be able to have their medication changed through a pharmacist's intervention.

A repeat prescription was defined, for the purpose of this study, as 'a medicine listed on the repeat medication screen of the patient's computer record that had been issued within 12 months of the start date of the study'. The study pharmacist (DRP) examined the medication records of all selected patients and excluded those who were not taking any medications issued as repeat prescriptions.

## Patient consent

### Obtaining consent

Ethical approval was sought and granted from the local Ethics Committee. All eligible patients were sent a letter inviting them to participate (see appendix 2). This letter was sent on practice-headed paper, together with a consent form and freepost envelope. If after 2 weeks there had been no response, a reminder letter was sent. If there was no response to the reminder letter, a member of the study team rang the patient to determine whether or not he/she wished to be included in the study.

Patients were informed in the letter that, if they consented to be included in the study, they would be randomised to either a control or study group. If they were randomised to the control group, their medical record would be examined but they would not be interviewed by the study pharmacist. If randomised to the intervention group, they would be seen by the study pharmacist when their medication was next due for review or as soon as possible if the practice had not set such a date.

### Representativeness of study sample

It was important to know the reasons for non-participation, because assessment of generalisability (or 'external validity') of the results follows from an understanding of the representativeness of the sample. The reasons for patients declining to participate in a study and whether these patients were as typical as those who did consent, in terms of age, gender and numbers of repeat medicines, were therefore explored.

Data for consenting and non-consenting patients were collected on the stratification factors of age,

gender and numbers of repeat medicines. Multiple logistic regression was used to assess the association of each factor with consent rates. The results are presented as odds ratios with 95% confidence intervals (CIs).

## Randomisation

The unit of randomisation was the patient. The names of all eligible patients from each practice were entered on an Excel® spreadsheet and given a patient number. The patient numbers were randomly sorted using an Excel facility and the resulting order was used to invite patients serially to participate until the required number had consented. Patients who consented to be in the study were stratified by age (65–74 years and 75 years and over) and numbers of repeat medicines (1–4 and five or more). This resulted in four groups:

- 65–74 years of age: 1–4 medicines
- 65–74 years of age: five or more medicines
- 75 years and over: 1–4 medicines
- 75 years and over: five or medicines.

In all, 2000 patients were contacted because it was anticipated that not all patients would agree to participate in the study. Following consent, patients in each of these groups were then randomised to an intervention group or control group using random number tables. The patients' randomisations were not blinded to the research pharmacist, as he would be the individual conducting the patient interviews.

## Appointments for medication review clinics

Intervention group patients whose medication review date had already been set on the practice computer were reminded to attend a medication review clinic by attaching a note to the last repeat prescription that was issued before the due date (see appendix 3). The note asked patients to book an appointment with the practice receptionist and those who were physically able were asked to attend the medication review clinic. If they were not mobile, the study pharmacist visited them at home. Immobile patients were contacted by phone when their medication was due for review. A standardised form of wording was used to remind patients about the reasons for medication review and their previous agreement to be in the study, and they were given an opportunity to

decline if they wished. If they still agreed to be in the study, an appointment was made.

Patients who did not have a set medication review date were booked into the medication review clinic at the earliest opportunity, by writing and asking them to contact the practice receptionist or by ringing them.

Practice receptionists were given a set procedure to follow, so that they were clear about how and when to book patients into the clinics (appendix 4).

If a patient failed to attend a clinic, they were telephoned and asked to make another appointment. If they failed to attend a second time, the doctor was notified that a medication review had not occurred. When appropriate, recommendations for changes to therapy were still made for patients who did not attend a clinic. Data were recorded on the numbers of patients who did not attend first or second clinic appointments, and the nature of the interventions made in these patients' medications was analysed separately.

## Data recording

### Patient details

The age and gender, and whether or not a patient was able to attend the surgery, were recorded (appendix 5). Consent details were recorded and the consent form kept on file. If patients subsequently left the practice, withdrew from the study or died, the date was recorded.

### Pre-intervention data

The three key dates that related to data recording were:

- 1 December 1998–31 May 1999: pre-baseline
- 1 June 1999: study start date
- 31 May 2000: study end date.

The three sets of data were used to measure the extent of change of medication during a period before the study began (when prescribing could not have been influenced by the study). This change was then compared with any change in the control group during the study period. If the control group changed more during the study period than in the pre-study period, this would give a measure of any contamination (that is, of doctors making changes to the medication of patients in the control group as a result of the influence of the ongoing activity on patients in the intervention group).

Patients' records were also examined for evidence of any documented medication review during the 6 months pre-baseline. This was to give an uncontaminated measure of the normal rate of review in each practice, again allowing the control group to be validated as a true control.

The numbers of general practice attendances, hospital outpatient attendances and acute hospital admissions in the 6 months prior to baseline data collection were documented for both intervention and control group patients, and were compared with the same types of data collected during the year that the interventions took place. A change in the frequency of these factors acted as a measure of any external influence.

### Data recorded

Data were recorded on the numbers of repeat prescriptions, numbers of dosage intervals per day and costs per 28 days of repeat medication. Repeat medications were defined as those on the repeat medications menu that had been requested in the 12 months before the study started (1 June 1998–31 May 1999).

Attendance at the practice was measured by counting the numbers of attendance dates listed in the medical records. The number of hospital outpatient visits and admissions was measured by counting the numbers of hospital letters and discharge advice notes, respectively. A summary of the data recorded is presented in *Table 2*.

### Post intervention data

The following data were collected for both the intervention and control groups 12 months after the start of the intervention period (1 June 2000).

1. Whether a documented medication review had taken place in the previous 12 months.
2. The number and nature of changes in the medication regimen.
3. The number of repeat medicines listed on 1 June 2000.
4. The number of times medications were taken per day at 1 June 2000 (minimum 1, maximum 4).
5. The cost of 28 days of repeat medication at 1 June 2000.
6. The number of hospital admissions in the previous 12 months.
7. The number of outpatient consultations in the previous 12 months.
8. The number of general practice consultations in the previous 12 months.
9. Whether a patient had died, left the practice list, or gone into residential care.

**TABLE 2** Pre-baseline, baseline and post-baseline data collected

Parameters measured	Period of data collection		
	Pre-baseline (December 1998)	Baseline (June 1999)	Study end (June 2000)
Number of repeat medications	✓	✓	✓
Dosage interval	✓	✓	✓
Cost of 28 days' supply of repeat medication	✓	✓	✓
Evidence of medication review	✓	✓	–
Number of GP attendances	✓	✓	–
Number of consultant outpatient attendances	✓	✓	–
Number of acute hospital admissions	✓	✓	–

## Patient interviews

### The medication review process

The pharmacist conducted a clinical medication review as outlined in appendix 1. The procedure for the medication review process had been agreed with the GPs (see appendix 6). The pharmacist used his own clinical judgement and knowledge to determine whether an intervention was required. Treatment recommendations were based on national and local guidelines (for example, health authority or primary care group), if available. If the practice had its own guidelines and/or a formulary, these were also used to formulate interventions. Agreement was sought with each practice (and with each GP within the practice) for the level of intervention that the pharmacist could make without seeking prior approval from a doctor. A list of examples of suggested interventions was offered to the practice for discussion and agreement (appendix 7). Each practice was allowed to alter the list, as they considered appropriate.

### Patient interview

The format to be followed in the interview, including the list of questions, is shown in appendix 8. Each condition being treated was discussed with the patient. This involved making enquiries about relevant symptoms (for example, swollen ankles in heart failure) to determine whether they were adequately controlled. In conditions that required clinical or pathological monitoring, the pharmacist ascertained whether this had been done and directed the patient to the practice nurse or doctor for any check that was overdue. The pharmacist did not physically examine the patient or attempt to make a new diagnosis, except insofar as was obvious at the interview, for example, swollen ankles, rash,

breathlessness. However, if the symptoms led to suspicions that a new diagnosis might be required, and this was considered of sufficient severity, the patient was referred back to the doctor.

At review, confirmation was sought from the patient of the repeat medications listed on the practice computer. Differences between the practice record and what the patient actually took, as reported by the patient, were recorded and the record amended.

### Medication interventions

When a medication intervention was considered appropriate, this was undertaken by the pharmacist either without prior permission needing to be sought from the GP or after talking to the GP or was left for the GP to do. Recommendations fell into one or more of the categories shown in *Table 3* for each medicine reviewed.

If the pharmacists considered that GP approval was needed before making an intervention, then the pharmacist liaised with the GP. For these types of interventions a record was made of the GP's response to the advice:

- advice accepted and acted upon
- advice accepted but not acted upon
- advice not accepted and a reason given
- advice not accepted but no reason given
- advice outcome unclear.

An analysis was undertaken of the types of medication intervention recommendations, the reasons for making the recommendations and the GPs' acceptance of the recommendation types. For each **patient** there were a number of possible outcomes of the medication review process.

**TABLE 3** Medication intervention categories and reasons for intervention

<b>Medication intervention</b>	<b>Reason for intervention</b>	<b>Specifically:</b>
Stop drug	No indication	No indication ever appears to have been recorded
	Indication no longer valid	There was once an indication but it no longer applies (e.g. patient prescribed temazepam to help sleep during in-patient stay but continued once discharged to the community)
	Duplication of therapy	Two or more therapeutically equivalent medicines (e.g. piroxicam and ibuprofen)
	Non-adherence	Intentional: patient decides not to take the medicine Unintentional: patient not taking the medicine correctly because of forgetfulness, confusion, cognitive impairment, low intelligence or inability to open containers or use devices
	Adverse effects	Patient experiencing adverse effects from a drug: may be occurring at recommended dose or because dose is too high
Switch drug (same indication)	Contraindication	Patient has clinically relevant contraindication to a drug (e.g. beta-blockers and asthma)
	Adverse effects	See above
	Drug interaction	A drug interacts with either another prescribed medicine, an over-the-counter medicine, an illegal drug or alcohol
	Cheaper alternative	Equal or improved efficacy can be achieved with a less expensive medicine
Adherence counselling (no drug change)	Non-adherence	See above
Alter formulation, dose, timing	Formulation, dose or dosing schedule not optimal	Different formulation may give better efficacy
		Different formulation may reduce side-effects (e.g. modified-release nifedipine rather than plain nifedipine which causes more headaches)
		Patient cannot use the formulation type (e.g. metered-dose inhaler)
		Dose may need increasing to give desired effect or to reach an evidence-based dose
		Dose may need decreasing because it is more than is required to achieve desired effect
		Different dosing schedule more convenient for patient
		Better efficacy will be achieved with different dosing schedule (e.g. enalapril twice rather than once daily for hypertension)
Changing dosing schedules as a means of improving compliance are recorded under "compliance"		
Start drug (new indication)	Addition of drug for untreated indication	Patient has indication that is not currently being treated (e.g. asthma)
		Patient has identified indication that is not being treated optimally (e.g. takes digoxin for atrial fibrillation but would also benefit from warfarin to reduce chances of stroke)
Test required	Monitor efficacy Minimise adverse drug reactions Monitor adherence	Further tests required to determine if drug is working optimally or to detect toxicity or adverse effects
Technical	Generic switch Altering quantities on prescription Deleting unused medication from repeat record Adding dosage instructions	Tidy up repeat record (e.g. removing repeats no longer taken, standardising quantities, adding directions and adding to repeat menu drugs that are taken regularly and suitable to be given repeat status)
Discuss options with GP	Insufficient information to make recommendation Number of different options available	These must be discussed with the GP to decide which is best for patient
GP referral	Complex medication conditions New diagnosis suspected	Pharmacist unable to perform medication review adequately (e.g. further diagnosis required). Patient prefers to have review dealt with by GP
		Worsening of existing conditions requiring a medical assessment
Other		

1. **No intervention** The patient's condition is satisfactory, the medication judged appropriate and there are no apparent medication adherence issues. The patient is given a new review date by the pharmacist.
2. **Adherence counselling** The patient's condition is unsatisfactory because of non-adherence to their regimen. The pharmacist attempts to resolve the situation with direct advice and, if necessary, arranges to see the patient again.
3. **Medication change** The pharmacist judges that a change in medication would be appropriate. The doctor is consulted retrospectively (at the end of the clinic). The pharmacist recalls or telephones the patient to inform them of the change.
4. **Refer patient to GP** The patient has a new problem or an acute exacerbation of an existing one, and needs to be referred to a doctor.
5. **Discuss options with GP** There are number of possible options but no decision can be made without further professional advice.
6. **Test required** Testing or monitoring is required to measure efficacy of the medication or any potential adverse effects.

The links between the medication interventions and the consultation outcomes are shown in *Table 4*. Each medicine had one medication intervention and each patient consultation had one consultation outcome. Each patient could be on many medications. Thus, there could be a number of medication interventions applied to each patient. The classification of each patient's consultation outcome was based on the medication intervention that predominated. If the

medication intervention was in the category 'other' (see *Table 3*), a judgement was made about which consultation outcome best fitted it.

## Cost of medication and intervention

The cost of a month's supply (28 days) of a repeat medication was calculated using the net ingredient cost. This is the list price of a drug in either MIMS (the *Monthly Index of Medical Specialities*\* – for proprietary medicines) or the Drug Tariff† (for generic medicines). Prices from December 1998 were used to calculate costs in all parts of the study to avoid differences in expenditure caused by price changes during the study. For medications prescribed as 'when required', the cost was calculated from the average amount ordered by the patient over the last year (or part year if more recently prescribed). The time that the study pharmacist spent in preparation for a clinic, on the medication review clinics themselves, on home visits (including travelling time) and in discussing recommendations with GPs was recorded. Time spent in data collection and other study work was not recorded. The cost of the pharmacist's time was calculated using the Whitley pay scale E (without emergency duty payment), that is, £29,000 per annum.

## Pilot study

The study pharmacist carried out a pilot study in eight patients (two from each practice) to

**TABLE 4** Links between medication intervention and consultation outcomes

Consultation outcome	Medication interventions
No intervention	No change Technical intervention
Adherence counselling	Adherence counselling
Medication change	Stop drug Switch drug Alter formulation dose or timing Start new drug
Refer patient to the GP	Refer patient for GP consultation
Discuss options with GP	Discuss options with GP
Test required	Test required

\* Haymarket Publishing Services Ltd

† HMSO, on behalf of Department of Health



test the data collection forms and the intervention process. No changes to the method, patient interview or data collection forms were found necessary as a result. However, some valuable lessons were learnt about the use of the practice computer and medical notes to obtain an accurate repeat prescription history.

## **Analysis of results**

The analysis of results was on an intention-to-treat principle. All consenting and randomised patients were included in the analysis regardless of the uptake and attendance. Rates were compared using chi-squared tests and counts by Poisson regression.



# Chapter 4

## Results

### Details of study practices

#### Practice demography

The Leeds Health Authority provided a list of suitable practices, of which the first six were approached in random order. One practice did not wish to be involved in the trial. Another was rejected because it was in the process of changing its computer system. The remaining four practices agreed to be involved in the study. Details of the participating practices are given in *Table 5*.

The practices represented a range of different socio-economic groups across the city. Practice D had the highest proportion of patients attracting deprivation payments. Another practice (C) had a higher percentage (17%) of patients aged 65 years or over.

#### Prescribing characteristics

The costs/ASTRO-PUs are shown in *Figure 1*, together with the range for all Leeds practices. The Leeds mean cost was £21.42. The four study practices had slightly higher-than-average costs.

#### Practice computer systems

The computer system used by three of the practices was the *Egton Medical Information System (EMIS)*<sup>®</sup>. The computerised repeat prescription records of these practices were considered to be accurate records of patients repeat medications and medication history, since repeat medication prescriptions were issued using the computer, rather than being handwritten. There may, however, have been some missing data if occasionally a prescription was handwritten during a

home visit and the doctor did not update the computer on returning to the practice.

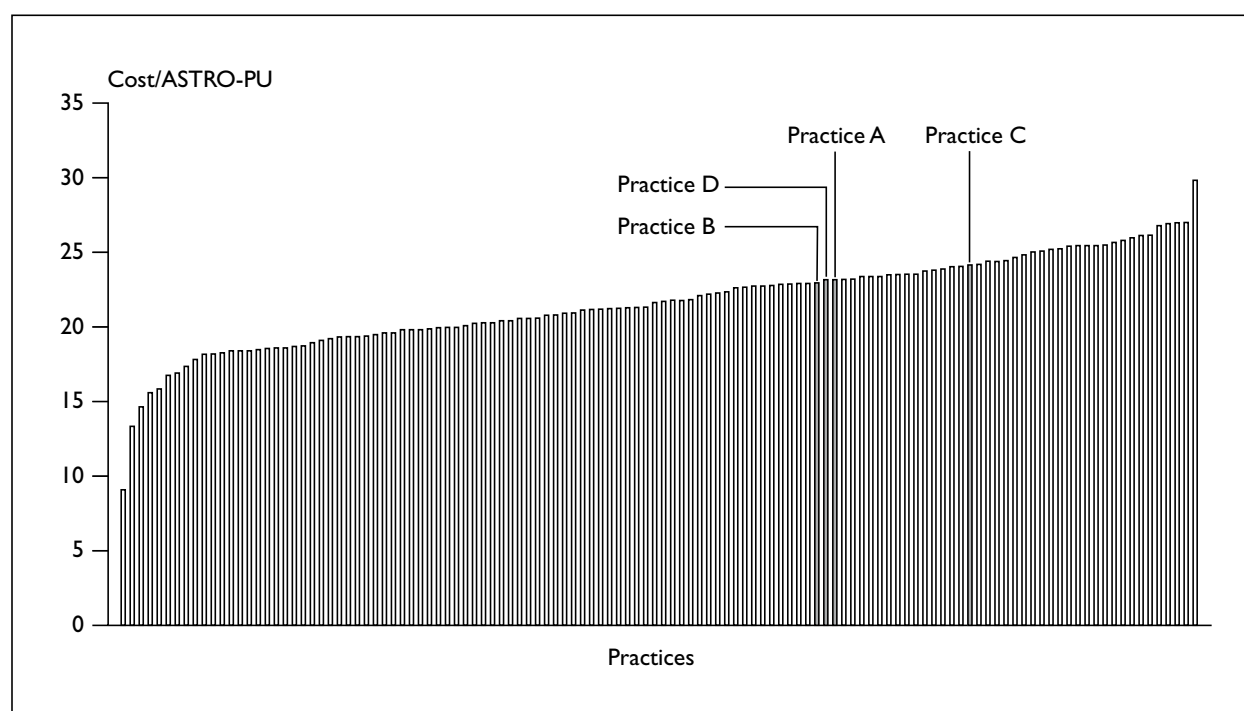
One practice (A) used the Phenix<sup>®</sup> computer system. This practice had two surgery locations and the computers at each surgery were not linked. Thus a change on one terminal did not appear on the other. However, this was not a significant problem because patients' repeat medications were usually issued at the surgery which they regularly attended. The content of the repeat prescription record (at Practice A) was complicated by the fact that discontinued repeat medications were not always deleted from the computer records. Hence, it was necessary to exercise caution in obtaining an accurate medication history. However, at this practice a physical record was made in the patient's notes every time a repeat prescription was issued. It was possible, therefore, to check the accuracy of the computer record by cross-reference to the notes. Medications were defined as no longer being a repeat if they had not been issued since June 1998. Medications for which there was no record of issue either in the notes or on the computer were excluded from the analysis.

The practice computers tended to record more elderly patients than the Leeds Health Authority records (*Table 6*). These additions were 'ghost patients' who had either died or left the practice list, and who should have been removed from their records by the practice.

Practice A was the least efficient at removing patients from their records when they died or

**TABLE 5** Details of participating practices (Leeds Health Authority data)

	Practice			
	A	B	C	D
Training	No	No	No	No
Number of surgeries	2	1	2	2
Number of GPs	4	4	5	4
Whole-time equivalent GPs	3.5	4.0	5.0	3.0
Number of female GPs	1.5	1	1	2
Number of patients registered with practice	6342	7647	8759	5454
Number of patients aged over 65 years (% of total)	826 (13)	1018 (13)	1455 (17)	695 (13)
Deprivation payments (%)	0.21	16.29	0.01	84.64



**FIGURE 1** Cost/ASTRO-PU for all Leeds practices in 1999

**TABLE 6** Numbers of patients aged 65 years or over as recorded by the practices and the health authority

	Practice			
	A	B	C	D
<b>Health authority</b>	821	1018	1455*	695
<b>Practice</b>	1473	1061	774	751
<b>Difference (%)</b>	55	4	Unknown*	9.2

\* There were 1455 patients aged 65 years and over registered with the health authority for the whole practice. Only patients at the practice's main surgery were included in the study, of whom 774 were aged over 65 years. It was not possible to identify from the health authority data which patients used only the main surgery

moved. There were an extra 652 patients who were no longer on their practice lists. To obtain a list of eligible patients, the lists were gone through by the research pharmacist, who deleted the names of patients who had left the practice or died.

## Patient recruitment

### Patient eligibility and consent

The four practices recruited to the study had a total population of 3308 patients over 65 years of age. The numbers of patients excluded (because of being in a clinical trial, a residential or nursing home, or having a terminal illness), the numbers of patients eligible and the number of repeat

**TABLE 7** Patient exclusions and eligible numbers for study inclusion

	Practice				Total
	A	B	C	D	
Total practice population aged over 65 years	821	1018	774	695	3308
Number in clinical trials	0	0	0	0	0
Number in residential/nursing homes	17	31	16	5	69
Number with terminal illness/GP did not want included	27	6	0	0	33
Number having no repeat medicines	129	253	177	142	701
<b>Total eligible patients</b>	<b>648</b>	<b>728</b>	<b>581</b>	<b>548</b>	<b>2505</b>

medicines recorded on the practice computer are shown in *Table 7*. In all, 76% of patients (2505) were eligible for study inclusion (that is, they were aged 65 years or over, on at least one repeat medicine and did not meet any of the exclusion criteria), and 2403 were contacted to ask whether they would consent to be included in the study.

The numbers of patients contacted on the first mailing, second mailing and, subsequently, by telephone are shown in *Table 8*. The aim was to recruit 1200 patients. The total positive response was 1188 (approximately 50% of those contacted). Telephoning only gained an additional 27 consenting patients (22% of those telephoned) from Practice D and 19 (8% of those telephoned) from Practice B. The final numbers for those responding 'yes' or 'no', for when there was no response, and for those who had died are shown in *Table 9*. Twenty patients were known to have died between the time at which they were identified and when the invitation letter was sent. It is likely that a number of non-responders or those responding 'no' may also have died (with the form being completed by a relative).

No patients were recruited to the study when assent was given by a relative or carer. Data were not collected on the practices' ethnic mixes or on the ethnicity of consenting patients. However, the practices were known not to have large ethnic

populations. Hence, the study relates mainly to Caucasian patients who were born in the UK.

### Differences between consenting and non-consenting patients in terms of age, gender and number of repeat medicines

A selection bias could possibly have been introduced into the study if a particular type of patient was more likely to consent. An analysis of consenting and non-consenting patients was therefore undertaken to determine the external validity of the study sample.

The following parameters were compared:

- age
- gender
- number of repeat medicines.

The numbers of patients and consent rates are shown in *Table 10*, stratified by practice, age, gender and number of repeat medicines. There were no significant differences between practices. Patients were less likely to consent if they were older or female. Patients were more likely to consent if they were on five or more repeat medicines. The difference in consent and non-consent rates was statistically significant for the number of repeat medicines. However, the differences in terms of numbers of patients were very small and unlikely to have been meaningful in terms of affecting the study outcome.

**TABLE 8** Numbers of patients contacted on first and second mailings and by telephone

	Practice				Total
	A	B	C	D	
First mailing	533	734	586	550	2403*
Second mailing	337	528	367	435	1667
By telephone	0	137	0	125	262
Total number of patients consenting to inclusion (%)	271 (51)	357 (49)	292 (50)	268 (49)	1188 (50)

\* A random sample of all eligible patients was used for the first mailing, hence this figure is less than the 2505 shown in *Table 7*

**TABLE 9** Patients' rates of consenting and non-consenting to participation in the study

Response	Number of patients	Percentage of all contacts
Patient consented	1188	50
Patient declined	872	36
Patient had died	16	1
None	327	13
<b>Total</b>	<b>2403</b>	<b>100</b>

**TABLE 10** Numbers of patients and consent rates by stratification factors

	Consenting patients n (%)	Non-consenting patients n (%)	Odds ratio (95% CI)	p-value
<b>Practice</b>				
A	271 (51)	263 (49)	1.0	0.87
B	357 (49)	377 (50)	1.0 (0.81, 1.3)	
C	292 (50)	292 (50)	1.0 (0.82, 1.3)	
D	268 (49)	281 (52)	1.1 (0.86, 1.4)	
<b>Age (years)</b>				
65–74	736 (56)	569 (44)	1.0	< 0.0001
75+	452 (41)	645 (59)	0.54 (0.46, 0.64)	
<b>Gender</b>				
Male	524 (54)	438 (46)	1.0	0.0005
Female	664 (46)	776 (54)	0.74 (0.63, 0.88)	
<b>Number of repeat prescriptions</b>				
1–4	648 (47)	722 (53)	1.0	0.002
5+	540 (52)	492 (48)	1.3 (1.1, 1.5)	

The reasons found for patients not wishing to participate have been published elsewhere<sup>37</sup> and are summarised in appendix 9.

### Profile of study patients

#### Comparison of patients and their medication factors between the intervention and control groups

The allocation of the 1188 recruited patients to the intervention and control groups, according to the stratification factors of age, gender and numbers of repeat medications, is shown in *Table 11*. There were no significant differences between the intervention and control groups in terms of patient characteristics and numbers of repeat medications characteristics. The numbers of practice consultation rates, hospital outpatient consultation rates, and hospital admissions

between pre-baseline and baseline were also not significantly different between the two groups (*Table 12*). The mean age of the patients was 73.5 years (range 65–97 years) and 58% of participants were women. The median number of repeat medications was four (range 0–22), although less than 5% of patients were prescribed more than ten repeat medications. Four patients were accidentally included under the ‘intention-to-treat’ principle, despite having no repeat medications prescribed.

The level of balance achieved by the allocation procedure, in terms of non-stratification baseline and pre-baseline factors, is shown in *Table 12*. At the time of data collection, notes for baseline and pre-baseline data were unavailable for 11 patients: seven had died (six in the intervention group)

**TABLE 11** Comparability of groups for stratification factors and demographic data

Stratification factor	Group	Practice				All patients (n = 1188)
		A (n = 271)	B (n = 357)	C (n = 292)	D (n = 268)	
Mean age, years (SD)	Intervention	74 (6.3)	74 (6.1)	73 (6.3)	74 (7.8)	74 (6.6)
	Control	75 (6.1)	74 (6.4)	73 (6.2)	73 (6.6)	73 (6.4)
Female (%)	Intervention	81 (55)	103 (56)	74 (50)	81 (62)	339 (56)
	Control	62 (50)	101 (58)	78 (54)	84 (61)	325 (56)
Median number of repeat prescriptions (IQR)	Intervention	5 (3, 7)	4 (2, 6)	4 (2, 7)	4 (2, 6)	4 (2, 7)
	Control	4 (3, 6)	4 (2, 6)	5 (3, 7)	4 (2, 6)	4 (2, 6)

**TABLE 12** Comparability of groups for health indicators and outcome measures before the trial

Factor	Intervention (n = 598)	Control (n = 579)	All patients (n = 1177)
<b>Pre-baseline</b>			
Median number of repeat prescriptions (IQR)	4 (2, 6)	4 (2, 6)	4 (2, 6)
Median cost per month (IQR)	£17 (5, 35)	£19 (6, 37)	£18 (6, 36)
Median dosage intervals per day (IQR)	2 (1, 3)	2 (1, 3)	2 (1, 3)
<b>At baseline</b>			
Median cost per 28 days (IQR)	£20 (7, 38)	£21 (7, 39)	£20 (7, 39)
Median dosage intervals per day (IQR)	2 (1, 3)	2 (1, 3)	2 (1, 3)
<b>Between pre-baseline and baseline dates*</b>			
Median number of GP attendances (IQR)	3 (1, 5)	3 (1, 5)	3 (1, 5)
Median number of hospital stays (%)	86 (14)	72 (12)	158 (13)
Median number of outpatient visits (%)	236 (40)	257 (45)	493 (43)

\* Data missing for three patients: intervention group 1, control group 2

and four (all in the intervention group) had left the practice lists.

Costs of repeat medications ranged from nothing in the pre-baseline to baseline period to £266, with only 4% in excess of £100 per month. Dosage intervals ranged from zero to four times daily, except for one patient with five dosage intervals. Most patients, 64%, had one or two dosage intervals.

The median number of practice consultations in the pre-baseline to baseline period was three in both groups. One patient had as many as 40 practice consultations in the pre-baseline phase but only 35 (3%) patients had in excess of ten consultations. The numbers of patients having at least one hospital outpatient appointment or admission in the pre-baseline to baseline period are shown in *Table 12*. In the pre-baseline period, 681 (58%) patients had no outpatient appointments, 64 (5%) patients had more than three appointments and one had 12 appointments and, in the same phase, 131 (11%) patients had a single hospital admission, and 27 (2%) had required more than one admission, up to a maximum of eight admissions.

#### Comparison of medication review rates

The rate of medication review in the 15 months before the study began was 201/591 (34%) in the intervention group and 208/577 (36%) in the control group. There was no statistically significant difference between the groups. In total, 409 patients (36%) did not have a medication review in the 15 months up to the start of the study (1 March 1998–31 May 1999).

The review rates between practices ranged from 56% to 71%.

## Patient exclusions and drop-outs

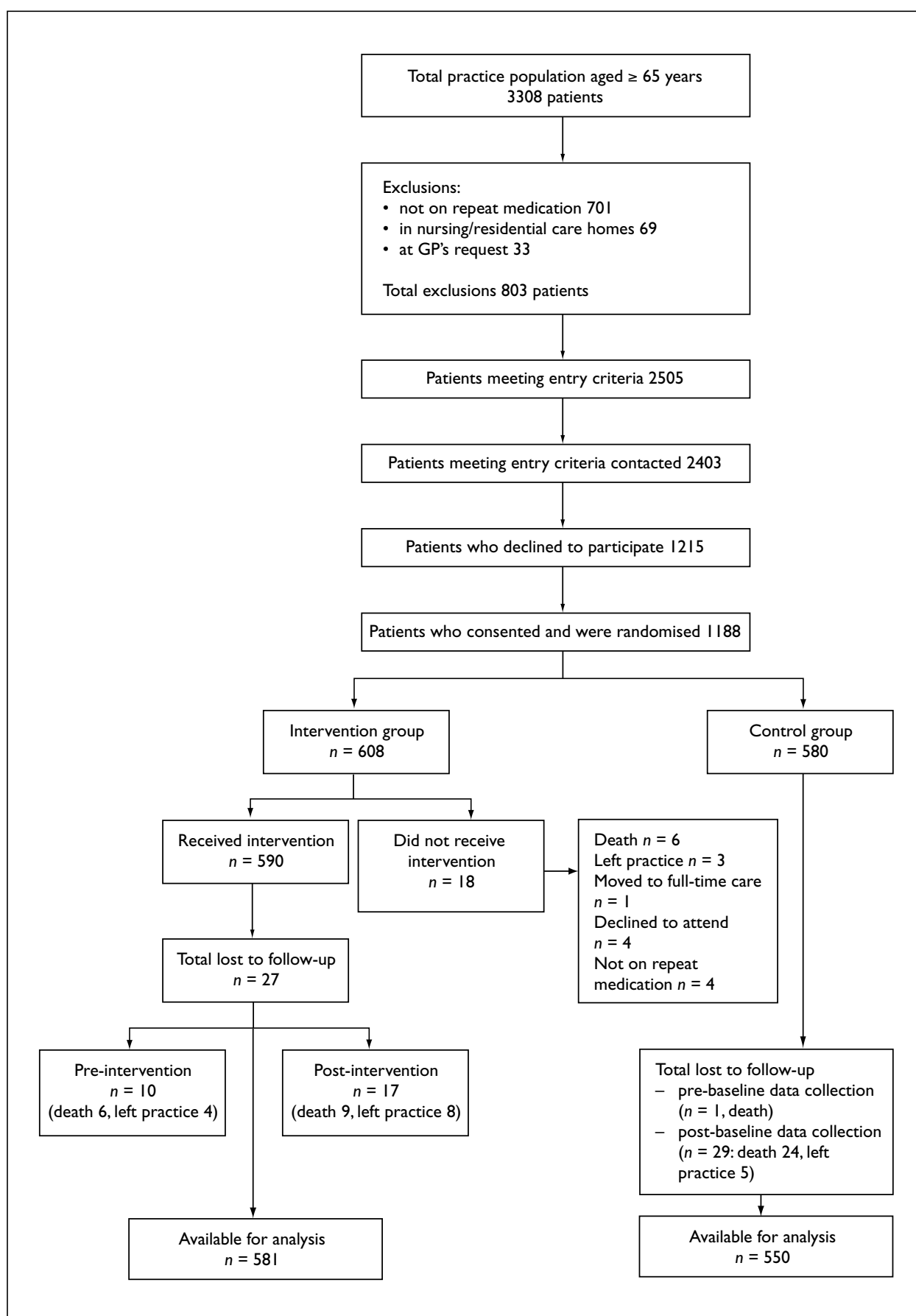
The progress of patients through the trial and the reasons for exclusion from data analysis at each stage are shown in *Figure 2*. Before the date for outcome assessment, 40 (3%) patients had died (15 from the intervention and 25 from the control group) and 17 (1%) had left the practice lists (12 from the intervention and five from the control group). The notes on the numbers of GP consultations, outpatient appointments and hospital appointments were unavailable for a further two patients (both in the intervention group). Of all the patients, 1131 had adequate data for inclusion in the principal analyses (581 in the intervention and 550 in the control group).

## Patient outcomes

### Medication changes

The mean number of changes per patient was 2.2 in the intervention group and 1.9 in the control group: difference (95% CI) = 0.31 (0.06 to 0.57);  $p = 0.02$ .

The types and numbers of changes that were made to patients' repeat prescriptions are shown in *Table 13*. More control group than intervention group patients started on at least one new drug during the study period. More intervention group patients experienced each of the other medication changes.



**FIGURE 2** Patient randomisation and the reasons for exclusions from the final analysis



**TABLE 13** Numbers (%) of patients experiencing at least one change in their repeat prescription list during the study period

Type of change	Intervention group (581 patients) n (%)	Control group (550 patients) n (%)	Total (1131 patients) n (%)
New drug started	265 (46)	270 (49)	535 (47)
Existing drug stopped	239 (41)	180 (33)	419 (37)
Existing drug switched	119 (20)	93 (17)	212 (18)
Dosage	98 (17)	61 (11)	159 (14)
To generic version	64 (11)	37 (7)	101 (9)
Formulation	17 (3)	12 (2)	29 (3)
Frequency of administration	6 (1)	0 (0)	6 (1)
<b>Total number of patients</b>	<b>438 (75)</b>	<b>397 (72)</b>	<b>835 (74)</b>

**TABLE 14** Changes in numbers of repeat medicines per patient during pre-baseline period and study period

	Change during pre-baseline period December 1998–June 1999	Change during study period June 1999–June 2000
Intervention group	+0.3 (7.0%)	+0.2 (3.6%)
Control group	+0.4 (9.1%)	+0.4 (9.4%)

**TABLE 15** Changes in count, cost and timing of repeat medications: a positive change represents an increase from June 1999 to June 2000

	Intervention group Mean (SD)	Control group Mean (SD)	Group difference Mean (95% CI)	t-test p-value
Change in count	0.2 (1.55)	0.4 (1.53)	-0.2 (-0.4 to -0.1)	0.01
Change in cost	£1.80 (17.55)	£6.53 (21.99)	-£4.72 (-7.04 to -2.41)	0.0001
Change in dosage frequency	-0.1 (1.01)	-0.2 (0.98)	0.1 (-0.0 to 0.2)	0.17

### Medication numbers: pre-baseline compared with study period

During the pre-baseline period the numbers of medication changes per patient in both the control and intervention groups were similar (Table 14). During the study period, the numbers of repeat medications per patient remained similar to baseline in the control group and decreased in the intervention group, which suggests that contamination between the two groups did not occur.

### Medication costs

Medication costs rose in both groups but the rise was significantly less in the intervention group (Table 15). The cost saving on medication in the intervention group compared with the control group was £4.75 per 28-day month, which, extrapolated for 1 year, is £61.75 per patient.

### Dosage intervals

Medication dosage intervals reduced slightly in each group but there was no evidence of a difference between the groups (Table 15).

### Other outcomes

The numbers of outpatient consultations and hospital admissions made by patients in each group during the 12-month study period is shown in Table 16. There was no evidence of a difference between the groups.

### Practice consultations

There were no differences in the numbers of practice consultations between the two groups over the study period, June 1999–June 2000 (Table 16).

### Economic impact of the pharmacist's medication review

The annual saving on medication net ingredient costs was £62 in the intervention group compared with the control group. The pharmacist took an average of 20 minutes per patient to conduct the review and deal with any necessary changes. The gross cost of the pharmacist's time was £21 per

**TABLE 16** Use of health services during the study period, June 1999–June 2000

Section of NHS	Intervention group (579 patients)	Control group (550 patients)	p-value
Median number of GP consultations (IQR)	6 (3, 10)	6 (3, 10)	0.69 <sup>a</sup>
Median number of outpatient appointments (IQR)	1 (0, 3)	1 (0, 3)	0.41 <sup>a</sup>
Number of hospital admissions (%):			
0	469 (81%)	458 (83%)	
1	78 (13%)	55 (10%)	9,16 <sup>b</sup>
> 1	32 (6%)	37 (7%)	
Number of deaths (%)	15 (2.5%)	25 (4.3%)	0.56

<sup>a</sup> Mann–Whitney test; <sup>b</sup> chi-squared test

hour or £7 per patient reviewed. The net cost saving per patient per year was therefore £54.

## Outcomes of medication review clinics

### Patient attendance

In all, 608 patients were randomised to the intervention group, and 591 medication review consultations were held for 590 patients. One patient was seen twice. The reasons for not seeing the remaining 18 patients are as follows:

- six patients died
- one patient went into a nursing home
- three patients left the practice area
- four patients declined to be interviewed or failed to attend the scheduled interview
- four patients were not receiving repeat prescriptions at the time of their interviews.

Of the patients who declined to be interviewed, two were from one practice. One patient who gave a reason for wishing to withdraw had schizophrenia and was concerned that his medications would be stopped by the pharmacist.

It was seldom necessary to invite patients back for follow-up. With the exception of one patient who was seen twice, all other patients were seen only once. Follow-up was generally by telephone. Of six patients who failed to attend for their first clinic appointment, four attended when invited again; they had either been too ill to attend, in hospital or had forgotten their appointments. The remaining two patients failed to attend a second time. Thus 590 of the 608 patients who consented and were randomised to the intervention group (97%) were seen. This compared with 44% of patients in the control group who received a medication review from the doctor during the same period.

### Type and range of repeat medicines

The intervention group patients were receiving 2927 medications on repeat prescriptions. The largest group of prescribed medicines was cardiovascular (1161, 40%), followed by central nervous system (CNS: 402, 14%), gastrointestinal (373, 13%), respiratory (252, 9%) and musculo-skeletal (242, 8%) medications. Taking the CNS medications as an example, the *British National Formulary* (BNF) chapter on the CNS covers a wide range of medications<sup>38</sup> and, using its sub-sections to break down the above figure into those most frequently prescribed, gives:

- hypnotics and anxiolytics, 43 items
- antidepressants, 77 items
- nausea and vertigo, 22 items
- analgesics, 231 items.

### Outcome of medication review consultation

Of the 591 (44%) patient consultations, 258 resulted in a recommendation. The outcomes of the medication review consultations are shown in *Table 17*.

### Outcome of medication interventions

A recommendation was made for 603 of the 2927 (21%) repeat medications prescribed. The medication interventions made are shown in *Table 18*.

#### No change

The recommendation for no change in medication applied equally to medicines from all the chapters of the BNF.<sup>38</sup>

#### Stop medicine

Recommendations for stopping a medicine were fairly evenly spread throughout all medication types. The most frequent recommendations for stopping a medicine, as they related to the chapters of the BNF,<sup>38</sup> were:

**TABLE 17** Outcome of medication review consultations

Outcome recommendation	Number of patients (%)
Treatment satisfactory	333 (56)
Adherence counselling	35 (6)
Medication change	170 (29)
Doctor referral	28 (5)
Recommendation for performing a test	25 (4)
<b>Total</b>	<b>591 (100)</b>

**TABLE 18** Medication interventions by type

Intervention type	Number of interventions (% of total number of medicines)
No change	2324 (79)
Stop medicine	118 (4)
Switch medicine	43 (1.5)
Alter dose, formulation or timing	86 (3)
Adherence counselling	80 (3)
Start new medicine	17 (< 1)
Technical	177 (6)
Test recommended	61 (2)
Discuss options with GP	5 (< 1)
GP consultation required	16 (< 1)
<b>Total</b>	<b>2927 (100)</b>

- chapter 1: gastrointestinal – 25 recommendation/373 medications in intervention group (6.7% of medications in this group)
- chapter 3: respiratory – 17/252 (6.7%)
- chapter 9: nutrition and blood – 5/26 (6.1%)
- chapter 5: infections – 2/10 (20%).

The high value for the infections section is a reflection of the low number of these agents prescribed as repeats.

The recommendations for stopping a medicine are listed in *Table 19*. The most common reasons were either the lack of an indication, the indication was no longer valid, or there was duplication of therapy.

Of the 118 recommendations made, 104 (88%) were implemented (*Table 20*).

The most common reason for not implementing a suggestion was when the GP agreed to the

**TABLE 19** Reasons for recommending stopping a drug

Reason	Number of interventions (%)
Indication no longer valid	40 (34)
No indication	34 (29)
Duplication of therapy	21 (18)
Adverse effect	6 (5)
Non-adherence	6 (5)
Other	6 (5)
Dose not optimal	2 (2)
Contraindication	2 (2)
Drug interaction	1 (1)
<b>Total</b>	<b>118 (100)</b>

**TABLE 20** Numbers of recommendations implemented

Recommendation type	Number of suggestions	Number (%) remaining implemented
Stop drug	118	104 (88)
Switch to a different drug	43	31 (72)
Alter dose, formulation or timing	86	74 (86)
Start drug	17	12 (71)
Technical change	177	164 (93)
Test required	61	48 (79)
<b>Total</b>	<b>502</b>	<b>433 (86)</b>

change but indicated that he/she would make the change rather than the pharmacist (*Table 20*). Analgesics were the group of medicines most commonly restarted.

#### Switch drug

A recommendation was made to switch 43 items (2%) (see *Table 20*).

Again using the BNF chapters as a means of breaking down the figures,<sup>38</sup> the distribution was spread fairly even across types although the numbers were small. Cardiovascular (16/1161, 1.4%), nutrition and blood (3/82, 3.7%), and musculoskeletal (7/242, 3%) medications were the most common groups for which a switch was recommended. The main reasons were adverse effects, the formulation not being optimal, or a lack of efficacy (*Table 21*).

At the end of the study, 31 (72%) recommendations for a switch remained changed (*Table 20*). Again, the

**TABLE 21** Reasons for recommending a switch in drug

Reason	Number of interventions (%)
Adverse effect	16 (35)
Not effective	6 (14)
Drug interaction	4 (9)
Formulation not optimal	6 (14)
More cost-effective alternative	5 (12)
Contraindication	2 (5)
Incorrect drug	2 (5)
Other	2 (5)
<b>Total</b>	<b>43 (100)</b>

**TABLE 22** Percentage of drugs for which a recommendation was made for an alteration in dose, formulation or timing (as per chapter in BNF)

BNF chapter	Percentage of drugs in chapter prescribed
Gastrointestinal system	2.4
Cardiovascular system	4.7
Respiratory system	2.0
CNS	1.5
Infections	0.0
Endocrine system	2.2
Obstetrics, gynaecology and urinary-tract disorders	0.0
Malignant disease and immunosuppression	0.0
Nutrition and blood	1.2
Musculoskeletal and joint diseases	2.1
Eye	0.9
Ear, nose and oropharynx [throat]	0.0
Skin	1.0

**TABLE 23** Reasons for making a technical change to repeat medicines

Reason for making change	Number of medicines changed
Drugs still listed on patients repeat record but no longer taken	73
Switch to a generic formulation	50
Change instructions to match what patient actually takes	29
Switch to a branded formulation	9
Insufficient quantity on repeat prescription	2
Other	14
<b>Total</b>	<b>177</b>

most frequent reason for not implementing a change was the GP saying they would make the change but not doing so. Analgesics were most commonly switched back or switched to something else.

### Alter dose, formulation or timing

An alteration to dose, formulation or timing was recommended for 86 items (3%) (Table 20). The main reason for such a recommendation was the dose not being optimal (59/86, 69%), followed by the dosing schedule not being optimal (13/86, 15%), the formulation not being optimal (9/86, 10%), and a more cost-effective alternative being available (5/86, 6%).

Cardiovascular drugs were those most likely to be recommended for change (55/1161, 4.7%), followed by gastrointestinal drugs (Table 22). This was mainly due to recommendations to: alter the dose of antihypertensives (for example, bendrofluzide, 5 mg to 2.5 mg – 14 items; atenolol, 100 mg to 50 mg – four items); change lipid-lowering therapy (six items); alter the dose frequency (for example, calcium channel blockers and ACE inhibitors to once-daily); change to a more cost-effective alternative (for example, Imdur® (AstraZeneca plc) to isosorbide mononitrate, 20 mg twice daily).

### Compliance

Recommendations to help improve patient compliance were made for 80 medicines. This recommendation did not appear to be affected by medicine type, that is, the reason for a recommendation was more likely to relate to patients' behaviour than to the actual medication they were taking. Following consultation, adherence counselling was recommended for 35 patients. An 'adherence' intervention was not affected by the number of medicines that a patient was taking.

### Start new drug

Starting a new drug was recommended in 17 instances (Table 20). These were either additional drugs for an existing condition or a new drug for an untreated indication.

Twelve (71%) of the new drug recommendations were implemented and remained changed. Again, the main reason for changes not being implemented was GPs saying they would do this but failing to.

### Technical

Technical interventions were those that did not directly affect clinical care. Interventions of a technical nature accounted for 177 (29%) of all interventions. The reasons for technical interventions are listed in Table 23.

In 29 instances, patients were not taking a medicine according to the instructions on the prescription. In each case, however, the patients were taking the drug correctly, and the prescribing instructions were altered accordingly. Most examples related to dispersible aspirin, 75 mg, two tablets daily, when the patient actually took only one tablet daily. At the end of the study, 164 (93%) of the technical recommendations remained unchanged. Only four of the 50 (8%) patients switched from branded to generic drugs changed back, in every case because the patient was unhappy with the generic medicine (for example, changing back from a beclomethasone inhaler to Becloforte® (Allen & Hanburys Ltd, Uxbridge). Of the 73 patients who had had medications removed from their repeat prescription list because they were no longer taking them, six had them restarted.

### Tests

Recommendations for tests were made for 61 medications (2%) (Table 20). These preparations were mainly included in the BNF chapters relating to gastrointestinal, cardiovascular, endocrine, nutrition, and blood disorders.

The most common recommendation was for cardiovascular drug monitoring, for which 45 recommendations were made (78% of the recommendations for tests). A recommendation for a test was a consultation outcome in 25 patients (4%).

The outcome of the tests is shown in Table 24. There was evidence that three of the ten patients who were never tested had failed to attend

**TABLE 24** Outcome of recommended tests

Outcome of test	Number of tests
Satisfactory	31
<b>Not satisfactory</b>	
<i>H. pylori</i> -positive	1
Spirometry	1
Full blood count	2
Thyroid function test	3
Cholesterol	8
Blood pressure	5
<b>Total</b>	<b>20</b>
Never done	10
<b>Total</b>	<b>61</b>

for an appointment. Three of the abnormal tests were not acted upon. These were all high total cholesterol levels in patients with coronary heart disease.

### Discuss options with GP

In only five instances was it necessary to discuss the options for recommendations with the patients' GPs.

### GP consultations

A referral to their GP was necessary for 28 patients. For 16 patients, the referral related to their prescribed medicines. For the remaining patients, the referrals were for other reasons: for example, a suspicion of a new disease that needed diagnosis by the GP. Details of each patient's case are provided in appendix 10.

### GP acceptance of the recommendations

Of the 603 medication interventions recommended, 395 (65%) were dealt with by the pharmacist without further reference to the GP (Table 25). The advice was rejected in 14 instances (6%) and the outcome of seeking advice was unclear in 15 (7%).

**TABLE 25** Recommendations to GP and outcomes

Recommended intervention	Number (%) of recommendations made to GP	Advice accepted and acted upon (%)
Drug should be stopped	62 (52)	52 (85)
Drug should be switched (same indication)	36 (84)	32 (89)
Alter formulation, dose or timing	47 (54)	43 (91)
Compliance counselling needed (but no drug change)	13 (16)	5 (38)
New drug required (new indication)	17 (100)	15 (88)
Technical (including generic switch)	5 (3)	5 (100)
Test required	7 (12)	7 (100)
Discussion with GP required	5 (100)	4 (67)
Patient requires GP consultation	16	16 (100)
<b>Total</b>	<b>208 (34)</b>	<b>179 (86)</b>

### Factors affecting the outcome of the pharmacist's medication review

The patient factors of age, gender and requiring a home visit, had no effect on the pharmacist's review resulting in an intervention. The chances

of an intervention increased with the number of medicines prescribed and with not having had a documented medication review in the preceding 12 months (*Table 26*).

**TABLE 26** Factors affecting the outcome of the pharmacist's medication review clinic

Variable	Number (% total) n = 589	Odds ratio (95% CI) for pharmacist's intervention	p-value
Age 65–69 years	191 (32)		
Age 70–74 years	174 (30)	0.86 (0.75–1.3)	0.50
Age 75 years and over	224 (38)	1.2 (0.79–1.8)	0.38
Gender = female	328 (56)	1.1 (0.78–1.6)	0.57
Home visit = yes	96 (16)	0.93 (0.58–1.5)	0.78
One repeat medicine	70 (12)		
2–4 repeat medicines	233 (40)	2.7 (1.4–5.4)	0.0039
5–7 repeat medicines	175 (30)	6.0 (3.0–12)	< 0.00001
> 8 repeat medicines	111 (18)	7.0 (3.3–15)	< 0.00001
Evidence of GP review	360 (61)	1.6 (1.1–2.3)	0.0095

# Chapter 5

## Discussion

### Outcome of the medication review clinics

#### Medication changes

It is not surprising that more intervention group than control group patients had changes in their medication. More importantly, the number of repeat prescriptions per patient increased by only 0.2 medicines in the intervention group, compared with 0.4 medicines in the control group. This difference reached statistical significance (see *Table 14*) and represents a substantial reduction in the total exposure of the intervention group to unnecessary medicines. There is no evidence that patients came to any harm as a result of this (mortality was actually less, and use of GP and hospital services remained unchanged). Most of this difference was accounted for by stopping unnecessary or inappropriate medicines; thus it is perfectly plausible that the reduced potential for adverse effects might have improved the well-being of the intervention group. Medicines that are not doing any good can only be harmful. It is also well documented that fewer medicines produce better compliance. The results of this study are comparable but not identical with the reports of others.

In a study of medication reviews conducted in the USA, the numbers of prescribed medications were found to be reduced by a pharmacist intervention<sup>39</sup> and a reduction of 32% in the total number of prescriptions over a 6-month period was claimed; however, this study was a retrospective analysis and was not controlled. Jameson and colleagues,<sup>40</sup> in an RCT of pre-selected patients at high risk of medication-related problems, found that the total number of medicines could be reduced by 1.1 over a 6-month period as a result of a single consultation with a pharmacist. However, this study enrolled only 56 patients and the results had wide CIs. Britton and Lurvey,<sup>41</sup> in an RCT of 672 patients, demonstrated that a pharmacist consultation could reduce the number of repeat medicines by 0.7 compared with a control group. This figure was higher than found in this study but the starting number of medicines was also higher. Britton and Lurvey included only patients on five or more medicines (mean 8.6), whereas this study included patients on one or more (mean 4). In a UK study,<sup>42</sup> it was found that

reviewing domiciliary patients did not produce any overall change in the number of prescribed medicines. Lowe and colleagues<sup>36</sup> undertook an RCT that included 152 patients from a general practice. In this study, the mean starting number of medicines was 4.1 and the pharmacist's review resulted in a mean decrease of 0.26 medications. The objective of the present study was to evaluate the effect of a clinical medication review. In other words, the review was of the patient and their disease(s). The objective was not necessarily to decrease medicines, since the review could have resulted in necessary new medication being initiated. It was found that 75% of patients had a medication change. Lowe and colleagues<sup>36</sup> found that over the 3-month period of the intervention, 47% of patients had a medication change.

It is reasonable to consider that the greater the complexity of a medication regimen, the less likely patients are to comply. Compliance decreases with increasing number of medicines.<sup>43,44</sup> Patients taking five or more medicines are less compliant than those taking fewer than five,<sup>45</sup> but above five the rate of poor compliance probably stabilises.<sup>44</sup> About half the patients in our study took five or more medicines. The number of patients on five or more medicines in the intervention group did not rise but rose by 4% in the control group (this figure was not included in chapter 4).

It seems unlikely that, given the degree of intervention, it would be possible to reduce the numbers of patients on five or more medications to any large degree but it does appear that the intervention kept the numbers from increasing. The growing evidence-base for treatment interventions, and the amount of additional guidance from government sources (for example, National Service Frameworks and guidance from the National Institute for Clinical Excellence) and from professional bodies (for example, the joint British recommendations on the prevention of coronary heart disease in clinical practice<sup>46</sup>) will inevitably mean that patients, especially the elderly, are prescribed more medications.

#### Effect on costs

The reduced rate of growth of medication items in the intervention group is reflected in the costs

of medication. The intervention resulted in a mean saving of £4.75 per patient/per 28 days or £61.75 per year. If a pharmacist were to run a full-time clinic, about 18 patients/day could be seen (20 minutes per patient). The pharmacist's salary would be £156/day (E grade, plus costs for employer's contribution to National Insurance and superannuation, and allowing for 6 weeks' annual holiday). It seems likely that the costs of conducting an initial medication review would be offset by the savings made by changing medications. It is not known if these savings can be replicated with subsequent reviews but it would seem unlikely. The savings on medication from seeing 18 patients would be £1116 per year (£62 × 18). A Scottish study of medication review showed savings of £37 per patient per year,<sup>47</sup> although this study was not controlled and the costs of running the medication review service were not described. In a study by the Leicestershire Health Authority,<sup>48</sup> savings of £36 per patient per year were demonstrated. The average time taken for each patient was 0.86 hours. The Department of Health project conducted in the Isle of Wight had costs of £29,627 for pharmacist's time and resulted in savings of £49,757.<sup>49</sup> The cost per patient was not calculated. Using precise figures for costs is misleading since they are soon outdated. However, it does appear that evidence from a number of UK studies support the concept that a pharmacist's medication review costs less to perform than it saves on medicine costs. No other UK studies have looked at associated costs such as increases or decreases in doctor consultation rates. In the USA, decreases in numbers of hospital admissions<sup>50</sup> and doctors' visits<sup>51,52</sup> have been claimed, although others found no differences in associated attendance rates.<sup>53</sup> It is not possible to assess the associated health costs based on the available evidence. However, this study would suggest that, since there is no overall change, then costs are also not affected.

### Effect on dosage frequency

Compliance rates have been shown to be improved for patients who take their prescribed medications as a once- or twice-daily regimen.<sup>54-56</sup> In review of 26 studies, Greenberg<sup>57</sup> found that once-daily regimens were not associated with better compliance than twice-daily (73% and 70%, respectively) but were better than three times daily (52%) and four times daily (42%).

The mean number of dosage intervals decreased slightly in both groups but the difference between the groups was not statistically significant. There has been a move in recent years by pharmaceutical

companies to produce modified release preparations that allow once- or twice-daily dosing. A large proportion of cardiovascular drugs are now manufactured so that they can be prescribed in this way, and medications of this type comprised a large percentage of all those prescribed to patients in this study.

Hence, it would have been surprising if the intervention had made a large difference to the number of different dose frequencies.

### Effect on consultation rates

There was no significant difference between practice consultation rates, outpatient consultation rates and hospital admission rates.

In the year June 1999–May 2000, the intervention and control groups had an average of 6.8 and 6.9 practice consultations, respectively. This is consistent with the national average of between six (for 65–74-year-old patients) and seven (for those at least 75 years old).<sup>58</sup> The consultation rate for both groups in the 12 months before the study started was 6.9. Thus the clinical medication review clinics had no overall effect on practice consultation rates.

### Doctor's medication review

In the 15 months prior to the start of the study, 65% of patients received a doctor's medication review. This compares with a value of 28% calculated by Zermansky<sup>17</sup> from an audit conducted in 1995.<sup>2</sup> In that study, Zermansky looked for evidence of review in the patients' records for three specific therapeutic groups – ulcer-healing drugs, hypnotic and anxiolytic drugs, and NSAIDs – and in all ages of patients. In this study, evidence of review was sought for all patients' current repeat medications but only in patients aged 65 years and over. The medication review rate in this study population was found to be higher. This may have been due to increased awareness of the need for medication review since the Zermansky paper was published and also to an awareness of the need for more thorough documentation as a result of the increased profile of clinical governance. It may also reflect the opportunistic benefit of the fact that older patients consult their doctors more often.

There were interesting differences between GPs' and pharmacist's reviews. The overall review rate for patients seeing the pharmacist was 97% compared with 44% for GPs.



Even if patients did consult their GP, this was not a guarantee that a medication review would occur. Of the patients who had a medication review, 92% had consulted their GP at least once and, of those whose medication had not been reviewed, 75% had consulted at least once. The reasons for the practice or outpatient consultation may not have been related to the medication that the patient was taking. The consultation rate may have been a measure of the patient's severity of illness or perceived need to see a doctor. In either case, it offered the doctor an opportunity to review the medication and, in many cases, this opportunity appeared not to have been taken. This may have been caused by a lack of time within the consultation or by the GP not considering it an opportune time for a review. Thus a patient might be on a complex regimen but, if some conditions were never discussed in the consultation, the opportunity of reviewing the medicines for that condition was missed. In this way, it is the patient who prompts the GP to undertake a review, rather than a full medication review being instigated by the GP. It could also be that reviews were occurring but not being documented. Conversely, the pharmacist was reviewing all the patient's medications.

The rates of medication review by GPs fell from 61% in 1998–99 to 43% in 1999–2000. This result is surprising, as the presence of the pharmacist in the practice might have been expected to increase the profile of medication review and, consequently, the GP review rate might have been expected to increase. The decrease in review rate occurred to an equal extent in both the control and intervention groups. The pharmacist documented the medication review in the notes of patients seen. A GP seeing this entry might therefore have considered another medication review unnecessary. This, however, does not explain why the rate also fell in the control group.

## Consultation outcomes

Problems exist when comparing the results of outcomes from different medication review studies because of the use of different definitions of outcome. In this study, two measures of outcome were used. The **consultation outcome** related to the overall outcome of the patient consultation: for example, treatment satisfactory or referral to doctor required. In addition, a **medication outcome** was recorded for the recommendations made about each medicine: for example, leave alone, stop, alter dose. An individual patient may

have had a number of interventions, for example, a medication change or compliance counselling, that affected different medications, but the intervention type that predominated was recorded as the main outcome of the consultation. Each medicine, however, could only have one outcome.

In the four main UK studies that warrant discussion, the following outcome measures were used. Granas and Bates<sup>26</sup> used drug-related problems, defined as “any problem with the prescribed medication that the community pharmacist considered not good for the patient”. Krska and colleagues<sup>27</sup> used pharmaceutical care issues that had previously been defined in the Scottish Clinical Resource and Audit Office Guidelines (CRAG).<sup>59</sup> Goldstein and colleagues<sup>24</sup> used potential problems that were categorised in a pre-prepared list: for example, duplication of therapy or inappropriate directions. No definition was provided in the study by Mackie and colleagues.<sup>28</sup>

In this study (see *Table 17*), a recommendation was made for 258 of the 591 patient consultations (44%), and medication interventions were recommended for 308 patients (50%). Granas and Bates reported medication intervention in 55% of the patients seen.<sup>26</sup> In other studies, mean numbers of care issues per patient of  $2.8 \pm 1.628$  and 7.727 were found. Goldstein and colleagues<sup>24</sup> and Granas and Bates<sup>26</sup> reported potential problems for 56% and 34% of reviewed medicines, respectively.

The most frequent types of intervention were stopping a drug, 118 (4%), and technical, 177 (6%). A technical switch was one in which the intervention did not directly affect patient care: for example, a branded-to-generic drug switch made for reasons of economy rather than patient care. A number of technical switches were to remove medications from repeat prescription lists that were no longer required. Although these types of interventions may appear trivial, they do have important implications. Any medicines on a patient's repeat prescription list would be considered by practice staff to have been authorised by the GP. Thus, a patient is at risk of unintentionally taking a medicine that should have been discontinued, and this could lead to adverse effects through, for example, drug interactions, overdose or drug–disease interactions. An individual patient may be aware of which medications on their list are current; however, if admitted to hospital or rendered incapable of managing their own medicines, they may inadvertently be given other medications from their repeat prescription list.

Similar studies, in which mainly community pharmacists have run medication reviews, have shown that interventions tend to be mainly of a technical nature. Two other studies<sup>24,26</sup> both found that the most common pharmacist interventions were 'drugs listed on repeat but no longer required', 'inappropriate quantity' and 'unsatisfactory directions'. These results reflect the degree of confidence that community pharmacists had to make recommendations. The lack of interventions of a clinical nature may have reflected a lack of skills or a lack of confidence in communicating suggestions to doctors. Mackie and colleagues<sup>28</sup> reported stopping unnecessary therapy to be the most common intervention occurring in 24% of cases. Since this paper has only been published as an abstract, no details are provided of the definition of 'unnecessary therapy'. Krska and colleagues<sup>27</sup> found that potential/suspected adverse drug reactions were the most common pharmaceutical care issue (24%). This figure appears high compared with those found in other studies. However, this was partly the result of the definitions used – if there was no evidence of monitoring in the last 12 months, this was classed as a potential adverse reaction.

An important outcome measure from this study is the extent to which the pharmacist needed to make referrals to the GP. If the pharmacist was unable to run the clinic, make suggestions and implement them without always having to refer the patient to the GP, there is an argument that the GP might just as well have seen the patient in the first place. Referrals to other members of the team were found to be low. GP referral was required for 28 patients (5%) and half of these referrals were for patients with suspected new diagnoses; others included medical conditions that were not well controlled, for which the pharmacist considered a GP review was required. All referrals resulted in a beneficial outcome for the patient and none were deemed to have been inappropriate (see appendix 10). Most referrals to other members of the healthcare team were to nurses for tests, such as blood pressure or cholesterol levels. Referrals for tests were required for 25 patients (4%). The results of half of the tests meant that further action was required. Again, none of the referrals for tests were inappropriate. It would be possible for pharmacists to be trained do these tests themselves, which would avoid the patient having to make another appointment.

Approval for implementation of suggestions was sought for 208 (34%) interventions. GPs accepted

86% of these recommendations. This was similar to the rates found in two other studies – 92%<sup>26</sup> and 84%<sup>28</sup> – but higher than that found in a third (58%).<sup>24</sup> The acceptance rate may have been high because the pharmacist only made recommendations that he thought were likely to be accepted. For example, few recommendations were made on the basis of economy alone. The cost savings may have been higher if more recommendations for therapeutic switches on cost grounds alone had been made. It was considered unlikely that GPs would accept these types of recommendations, because they did not directly benefit the patient and would have involved the practice in more monitoring work. They might also have been unpopular with patients.

Not all recommendations accepted by GPs were implemented. This problem has been found by others.<sup>27</sup> Recommendations were more likely to be implemented when left to the pharmacist. It would seem appropriate for the pharmacist to be delegated this responsibility to ensure that care plans are fully implemented.

Analysis of characteristics of patients, their medications and their GP care, showed that age, gender and requiring a home visit had no effect on the need for a pharmacist's review. The chances of an intervention occurring increased with the number of medicines and not having had a medication review in the last 12 months. Krska and colleagues<sup>27</sup> obtained similar results, with the number of pharmaceutical care issues being positively correlated with the number of medications being taken and the number of chronic diseases but not with age. This sheds doubt on previously held assumptions that it is the elderly and the housebound who are most likely to benefit from medication review. These results suggest that it is patients on increasing numbers of medications and who do not see the GP for reviews who are most likely to benefit.

## Study limitations

### Study pharmacist and practice selection

The study was designed to test the hypothesis that a suitably trained clinical pharmacist can effectively conduct clinical medication reviews in a general practice setting. The choice of the pharmacist would inevitably affect results, because the ability of the pharmacist to effect medication changes will result not only from the depth of his/her therapeutic knowledge but also from his/her skills

in persuading others (doctors and patients) to accept the recommendations. The study pharmacist had a great deal of experience in primary care (working as a Health Authority Pharmaceutical Advisor and general practice pharmacist) and thus the results probably reflect what is possible rather than what is probable from most pharmacists.

The choice of practice may also have affected the results. The practices were chosen randomly from a list that was produced according to agreed criteria. They represented different socio-economic areas of the city of Leeds. A larger national study, involving practices from different geographical areas with a number of different pharmacists conducting the reviews, would be required to test the validity of these results on a larger scale.

### Patient consent

The recruitment rate was 50%, which was close to that for similar study (but with younger patients) of 55%.<sup>28</sup> In two other studies on medication review, the recruitment rates were not revealed.<sup>24,30</sup> An evaluation of a 'health-check' on patients aged over 75 years in general practice<sup>60</sup> found that, on average, practices had a 64% uptake rate (range 54–82%). The health-check was not a trial but part of the practices' normal service. The recruitment rate for this study was therefore consistent with expectations.

Patients who agreed to participate in the study tended to be younger than those who did not wish to participate. Very elderly patients may have considered themselves too unwell to participate or too unwell to attend the surgery. Very elderly people may also have been less able to read or to understand the consent letter. A literature review of informed consent in older patients found evidence for impaired understanding of informed consent in the elderly.<sup>61</sup>

The reason why female patients were less likely to participate is not known. Women visit their doctor more often than men. They thus have more opportunities to discuss their health and medication with the doctor, and may feel less need to attend a medication review clinic.

The need to obtain patient consent in a trial inevitably results in bias towards patients who wish and are able to participate. More elderly, frail patients tend to be less able to read and understand consent letters. The study population was probably biased against this group. The results will consequently reflect a section of the elderly population that is more able and willing to access

healthcare. This will have implications for the application of the results to the running of a repeat medication review service.

### Patients who consented

Patients were randomised to the intervention or control group as they consented. Each practice had a mixture of intervention and control group patients. Thus, there was the potential for contamination between the two groups. However, the number of changes of repeat medication did not appear to have been affected in the control group as a result of the study, since the rate stayed the same for the pre-baseline and study periods, while for intervention group patients it fell.

Similarly, the rate of doctor medication review did not appear to have been disproportionately affected in the two groups as a result of the study. The intervention and control groups had doctor medication review rates of 61% and 60%, respectively, in the 12 months up to the start of the study. These figures fell to 44% and 43%, respectively, for the intervention and control groups.

The increase in costs in the run-in period seemed high. However, for the majority of patients (73.5%) the costs did not change. A small number of patients had a disproportionate effect on cost increases.

Increased costs appear to have been driven by an increase in new medicines for patients already having repeat prescriptions. Cardiovascular drugs accounted for the biggest therapeutic growth area.

### Patient exclusions, drop-outs and deaths

An equal number of patients were excluded from the study or dropped-out in both groups. The numbers were small, only 5.5%. In other trials of medication review in the UK, a drop-out rate of 25% has been seen.<sup>28</sup> In other publications, a trial profile is not described.<sup>24,26,29–31,62,63</sup> The greatest cause of drop-outs was death (40 patients) or leaving the list/going into a residential home (17 patients).

The difference in death rates between the intervention group (15 deaths, 2.5%) and the control group (25 deaths, 4.3%) was not statistically significant. The study was not powered to detect differences at this level. The difference in numbers is nonetheless intriguing and it would be important to look for differences in mortality in a larger study, especially as other studies in nursing homes have detected a reduction in mortality resulting from pharmacist intervention.<sup>64,65</sup>

If a pharmacist was actually able to reduce mortality in 608 patients by ten in 1 year, this would imply a number-needed-to-treat per annum of 60 to prevent one death – a much more effective intervention than the treatment of hypertension.

Plausible explanations for a reduction in mortality might include reduced exposure to adverse effects and interactions, or simply the return to health-care of patients who had avoided a review of their condition.

# Chapter 6

## Conclusions

A clinical pharmacist conducting consultations with elderly patients in general practice to review their medication resulted in significant changes in patients' medication, and a cost saving that was greater than the cost of the interventions. There was no discernible adverse effect on GP workload and no significant adverse effect on morbidity markers. It is considered that this model of care should be tested on a larger scale to confirm its validity and to measure morbidity outcomes in more detail.

The issues left unresolved by this work include the following.

1. **Are the outcomes of this study reproducible on a larger scale?** This was in effect a proof of concept study. It involved one pharmacist and only four practices in one urban area. The implication of the results is that the general adoption of this new role for pharmacists would improve quality of care and be self-funding. It would be rash to propose the adoption of this on a national scale, with all its implications for the future role of (virtually) a whole profession, without testing the concept across a larger and more representative population, and using a more typical pool of pharmacists.
2. **Does clinical medication review lead to measurable improvement in morbidity and mortality?** The scale of this study was not large enough to answer this question. There was a tantalising difference in mortality between the two groups but this did not achieve statistical significance. Here again, a larger study could address this issue.
3. **Patients living in residential and nursing homes are different.** They were not included in this study because the logistics of their medicine management are different and more complex. They are also, in general, frailer, less mentally competent and have more physical illnesses. They also take more medicines. An RCT of clinical medication review in this very special population would look at the value of extending the pharmacist's role in this vulnerable group. (The authors have recently received a grant from PPP Medical Healthcare Trust to examine this issue and work began in January 2002.)
4. **How frequently should medication be reviewed?** It is likely that the benefits of a clinical medication review for the individual will ebb away after a period, as new health problems emerge and old ones resolve. Not only do patients' health problems change with time – new drugs, new evidence and new diagnostic procedures can alter the context of treatment and lead to accepted treatments being superseded, improved or even abandoned. There is no evidence at all on how frequently medicines should be reviewed, regardless of who conducts the process. In the National Service Framework for older people,<sup>22</sup> it is proposed that elderly patients should have their medication reviewed annually, and those on four or more medicines twice yearly. This proposal is not evidence-based, however. The cost of repeated medication review is not trivial and the opportunity cost at a time of a major manpower crisis in the NHS is of vital relevance. A study of the rate of decay of medication review would be of great health economics value for both service and manpower planning.





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### **Contribution of authors**

AG Zermansky had the original idea for the study and refined it through discussions with DK Raynor,

CJ Lowe, N Freemantle and A Vail. DR Petty designed the implementation, ran the medication review clinics and collected the data. All authors refined the study design, were involved in the interpretation of the data and were members throughout of the steering group that oversaw the project. DR Petty drafted the initial paper, to which all authors then contributed. A Vail led the statistical analysis and N Freemantle the economic analysis.

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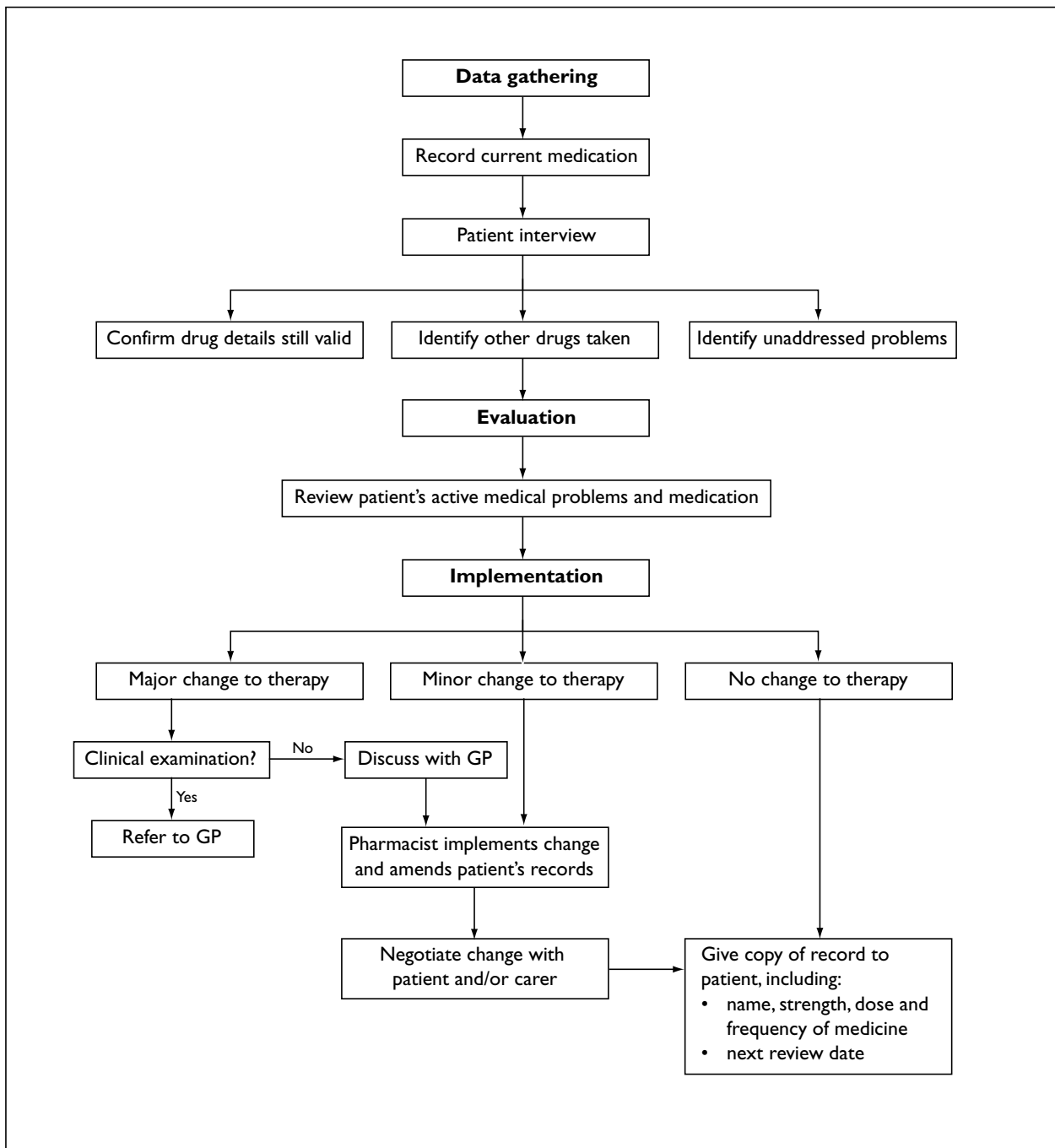
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# Appendix I

## Method of conducting clinical medication review

Pharmacist clinical medication review is a three-stage process: data gathering, evaluation and implementation (see *Figure 3*).



**FIGURE 3** The medicine review process: data gathering, evaluation and implementation

## Data gathering

### Identify drugs taken

Establish exactly what medicines the patient is actually taking, as this may differ from what is prescribed or recorded. This may be because the patient is not taking the medicine as prescribed or because the records are not up to date.

Patients may also be taking:

- other medicines regularly that are not prescribed – for example, 75 mg aspirin bought from a pharmacy
- illegal drugs
- medicines prescribed for another patient – for example, a relative.

### Identify indications

Identify the original indication of each drug from the medical record. If it is not recorded, the patient may know the reason why the drug was originally prescribed.

### Confirm adherence to medication

The patient may not always take a medication as prescribed. This may be intentional – that is, a conscious decision has been made not to take the medication, for which there could be a number of reasons:

- a misunderstanding of the purpose of the medication
- unpleasant side-effects, which have led to the decision to stop
- a perception that the medication is of little use.

Alternatively, the patient may want to take a medicine correctly but is unable to because, for example, he/she misunderstood the instructions. Any barriers that exist to taking a medicine correctly must be identified and rectified, such as:

- inadequate instructions on the label – for example, ‘as directed’
- packaging difficulties – for example, can’t open container or read label
- inability to use device – for example, inhaler or eye drops
- a complex medicine regimen that the patient does not understand
- memory difficulties, ranging from simple forgetfulness to dementia.

### Identify any unaddressed medical problems

A consultation may also highlight previously unknown or unrecognised problems. The

pharmacist has a responsibility to ensure that these problems are addressed. The pharmacist could treat minor problems, for example, analgesia for self-limiting conditions. Any major problems will need to be discussed with the patient’s GP. In some instances, changes to medication can be made without the patient seeing the doctor. However, if a clinical examination is required, the patient must be referred to the GP.

## Evaluation

### Continuing need for a medication?

This should be evaluated and discontinuation or switching to a more appropriate treatment considered.

### Does the patient understand the purpose of each drug?

Some patients may misunderstand the purpose of their medication, which may cause them to take it incorrectly. Appropriate education, supported by written information about the disease and the medicine, may be helpful.

### Is there evidence of suboptimal treatment of a recognised disease?

Evidence of the efficacy of each prescribed medicine should be sought, from both the clinical record and the patient. Although pharmacists are not qualified to perform a physical examination or to diagnose disease, certain obvious symptoms can be evaluated (e.g. swollen ankles in a patient with heart failure).

If evidence of suboptimal treatment exists, appropriate tests/investigations must be conducted (e.g. phlebotomy for urea and electrolytes, or blood pressure measurement). If the pharmacist is unable to perform the test, then the patient should be referred to the appropriate member of practice team: for example, nurse for blood samples or GP for diagnosis.

Once test results are known, suggestions for medication change should be discussed with the GP as necessary.

Drug doses may be suboptimal for a number of reasons:

- treatment may be initiated but not titrated to full dose (e.g. statins)
- prescribed dose may be too high in light of more recent evidence (e.g. bendrofluazide, 5 mg, or atenolol, 100 mg, for hypertension).

Alterations to prescribed doses will usually require the permission of the GP, and subsequent patient follow-up will be needed to ensure that the drug is satisfactory at the new dose level.

### Any side-effects?

Any side-effects of a medication may not be apparent from the clinical record, so asking the patient may help to identify any that are clinically relevant. Corrective action should be suggested to the GP and, should important adverse drug reactions be indicated, a Committee on the Safety of Medicines 'yellow card' must be completed.

### Any clinically relevant drug interactions or contraindications?

When clinically relevant interactions or contraindications are identified, the therapy should be amended. Depending on the arrangements with the practice, the pharmacist may be able to alter therapy without seeking prior permission from the GP.

### Costs

There is no direct benefit to the patient if a drug therapy is changed to a less expensive but equally efficacious alternative. However, since it releases further resources for the NHS, it is of benefit to the population as a whole. It will be necessary to have reached a prior agreement with the practice regarding the types of changes that are acceptable. These may include:

- switching from a branded to a generic drug
- changing the formulation – for example, from a powder inhaler to a metered dose inhaler
- switching from a modified release product to a plain drug
- switching from a combination product to individual components
- switching within a therapeutic group – for example, from one beta-blocker to another.

The reasons for making such changes need careful explanation to the patient, who should be given the opportunity to reverse the process if they are unhappy with the new medicine. The pharmacist should ensure that the change is appropriately monitored, and that the new medicine has equal or improved efficacy and tolerability as the previous one.

## Implementation

### Categories of intervention

In implementing the changes and their documentation, the pharmacist must establish

procedures with the practice, including changes that can be made according to an agreed protocol with or without consultation with the GP. For the purposes of a clinical medication review, eight broad categories of pharmacist intervention were defined (see *Table 3*, page 13).

### Implementing a change

The review of a patient's medication may have identified one or more serious problems that require input from a doctor, as in the following examples:

- identification of clinically significant side-effects or drug interactions that require a change to therapy
- initiation of new therapy – for example, aspirin or beta-blocker prophylaxis following myocardial infarction
- changing existing treatment to a different therapeutic group
- discontinuation of a therapy that has limited clinical value
- exacerbation of a problem for which the patient is already under treatment – for example, heart failure or chronic bronchitis
- identification of a new medical problem.

A judgement will be necessary on whether the patient needs to be referred to the GP for a physical examination. In some instances, it may be possible for the pharmacist to discuss the case with the GP and then implement the change.

There will be some minor changes to treatment that the pharmacist can initiate, without reference to the GP, such as:

- optimising dosage – for example, in the management of hypertension reducing the bendrofluazide dose to 2.5 mg
- checking cholesterol levels and increasing the dose accordingly
- formulation change
- switching from a proprietary to a generic medication.

### Patient education or counselling

Some patients, whose treatment is well established and who are experiencing no problems, will require no changes to their medication. The pharmacist should document current medication and record that no intervention was necessary. However, within this group of patients there may be some who, although they do not need a change, are not using their medication appropriately – for example:

- those who are not using their steroid inhaler regularly
- those who are unable to take their medication because, for example, they are unable to open bottle tops or are unable to instil eye drops
- those who perceive a treatment to be harmful or of no benefit.

The pharmacist will need to understand the patient's difficulties and negotiate a plan to help them use it correctly. This may involve providing them with appropriate information or advice, or it may involve liaison with the local pharmacy to change the manner in which the medication is packaged.

### **Communication and record keeping**

As practice pharmacists are part of a multi-disciplinary team and may not always be present at a practice, then good record keeping and communications are essential. To facilitate this, the following steps should be taken following a medication review:

- details of the review should be recorded in the patient's notes, including any proposals, follow-up requirements and expected outcomes
- for interventions that need permission from the GP before alterations can be made to treatment,

it is good practice for medico-legal reasons to obtain written permission, particularly if the intervention is not minor

- when medication has been changed, the computerised repeat medication record must also be altered, and a date for the next medication review entered in the record so that reception staff know when next to call in the patient.

It is important to communicate with the patient about changes to therapy. In some cases, it may be important to liaise with other members of the healthcare team or the patient's carers. Ideally, the patient should be given a written copy of their repeat medication list, including:

- the name of drug\*
- the strength, dose and frequency of administration\*
- the purpose of the medication
- the date of prescribing\*
- the review date\*
- under what circumstances the patient should see the doctor sooner.

The points marked with an asterisk (\*) form part of the repeat medication request slip.



## Appendix 2

# Patient invitation to participate in study and consent letter

### Initial patient invitation

«title» «given\_name» «family\_name»  
«address\_1»  
«address\_2»  
«post\_code»

«date»

Dear «title» «family\_name»

### Checking how your medicines are working – a research project

We are taking part in a research project at Dr ..... and partners' surgery. We hope you will agree to help us with it. It does **not** involve any experimental treatment with new drugs.

We want to see if a specially trained pharmacist [chemist] can help the doctor by checking how people's medicines are working. Doctors spend a lot of time checking patient's treatment, and we think a pharmacist may be able to do it just as well, and save the doctor time.

Half the patients who agree to take part will be invited to a consultation with Mr ....., who is our specially trained pharmacist. If you are invited to see him, he will have the details of all the tablets you take and why you take them. He will ask you about how they suit you and whether they are helping your condition. If he thinks you would benefit from a change in treatment, he will discuss it with your doctor before any change is made. If he is not happy about your condition, he will arrange for the doctor to see you. If you need to see the doctor anyway, you can arrange that in the usual way.

We will decide who will be invited to see Mr ..... by drawing names out of a hat! If you are not invited to see him, you will see your doctor in the usual way when your medicine needs checking. In that case we will not trouble you any further with the research project, but we will check through your medical notes in 12 months time to see how your treatment has been going.

If you are happy to take part please sign and return the attached form in the **FREEPOST** envelope provided. If you have any queries then please telephone Mr ..... on ..... If you agree to take part and are invited to see Mr ....., you will be given a date to attend the practice by the reception staff. If we don't hear from you, Mr ..... will telephone you in a couple of weeks so you can discuss any worries.

Taking part in this study is entirely voluntary. If you decide not to take part it will not affect your future treatment in any way.

Yours sincerely

Dr ..... and partners

## **Patient consent to participate form**

### **MEDICINES REVIEW PROJECT**

#### **Agreement to take part**

I have read the letter from Dr ..... and partners' practice, inviting me to take part in this project.

I understand that:

- it may involve one or more interviews with the project pharmacist
- the pharmacist will have access to my medical records
- medical confidentiality will be maintained.

I understand the letter and have (if necessary) discussed any questions or worries with Mr .....

I **agree** to take part in the project.

Signed .....

«title» «given\_name» «family\_name»

I **do not** wish to take part in the study.

Signed .....

## Second (reminder) letter

«title» «given\_name» «family\_name»  
«address\_1»  
«address\_2»  
«post\_code»

«date»

Dear «title» «family\_name»

### Checking how your medicines are working – a research project

You will have recently received a letter asking if you are willing to have your medicines checked as part of a study to see if a pharmacist [chemist] can help the doctors. This will be carried out at **your own doctor's surgery** or, if you are unable to attend the surgery, **a home visit** will be arranged. A copy of the original letter is enclosed.

Having read the letter, if you are happy to take part we would be grateful if you could complete the attached consent form and return it in the pre-paid envelope (no stamp required).

If you do not wish to take part then please indicate so on the attached form and we will not bother you again.

Yours sincerely

Dr ..... and partners

Enc.



## Appendix 3

### Invitation letters to patients for the medication review clinic

#### Letter inviting patient to make an appointment to attend medication review clinic

«title» «given\_name» «family\_name»  
«address\_1»  
«address\_2»  
«post\_code»

«date»

Dear «title» «family\_name»

We would like you to make an appointment with the practice pharmacist (Mr ..... ) to have your medicines reviewed. It should not take up much of your time – about 30 minutes.

Mr ..... can see you either at the practice or at your home. Please say which you would prefer.

Please would you bring all your medicines with you, including any you have bought from the pharmacy [chemist].

Yours sincerely

Dr .....

(sent on practice headed notepaper)

## Letter reminding the patient of their appointment

«title» «given\_name» «family\_name»  
«address\_1»  
«address\_2»  
«post\_code»

«date»

Dear «title» «family\_name»

This letter is to remind you to attend an appointment at the doctors' surgery on ..... at ..... The appointment is for your medicines to be reviewed. This will be done by the practice pharmacist, Mr .....

Mr ..... will have the details of all the tablets you take and why you take them. He will ask you about how they suit you and whether they are helping your condition. If he thinks you would benefit from a change in treatment, he will discuss it with your doctor before any change is made. If he is not happy about your condition, he will arrange for the doctor to see you. If you need to see the doctor anyway, you can arrange that in the usual way.

Please bring any medicines you take with you, including those bought from the pharmacy [chemist].

Yours sincerely

Dr .....

(sent on practice headed notepaper)

## Appendix 4

# Receptionists' procedure for booking patient medication review clinic appointments

### Letter explaining project to receptionists

Dear .....

#### Clinical medication review project

The practice is involved in a study that will be running over the next year. It involves a pharmacist reviewing elderly patients' repeat medications and making suggestions to the doctors if changes are thought necessary.

Some 300 patients (aged 65 years and older) have been written to, asking them if they would like to participate in the study. Patients may phone the practice to ask for more details. If they do, then please refer them to me on .....[telephone no.].

Patients who are happy to be included in the study will reply to us using a stamped addressed envelope. These patients will then be placed into either a 'study group' or a 'control group' (for the latter group, their medical records will be looked at but they won't see the pharmacist).

I will see all 'study group' patients when their next medication review date (as indicated on EMIS) is due. This may be any time in the next 12 months. If the practice has not set a review date, then I will see them as soon as possible.

It will be necessary for the practice to inform patients of the need to attend a medication review clinic 1 month before the due date. I will liaise with reception staff about the dates of the review clinics. Attached is a procedure for booking patients into a review clinic.

Thank you for your cooperation. If you have any questions about the study, please do not hesitate to contact me.

Yours sincerely

..... (Pharmacist)

## **Medication review clinic: patient appointment booking procedure**

1. Patients who are to be included in the study will be contacted by the study pharmacist to ask for their consent to be in the study.
2. A total of 300 patients, aged 65 years and over, who are on a repeat medicine will be included in the study.
3. A note will be made on EMIS to identify patients included in the study.
4. When a medication review date is set on EMIS, patients will be invited in for a medication review with the pharmacist.
5. The invitation will be issued by the practice reception staff, by attaching a note to the repeat prescription that is issued one month before the medication review date (see attached letter).
6. The letter will ask patients to telephone the practice to make an appointment sometime in the next month, or to make an appointment there and then if collecting a prescription.
7. The pharmacist will run two clinics per week (see attached schedule). Patients should be booked in at 45-minute intervals. If a home visit is required, this should be booked as the last appointment of the clinic that day. Please book only one home visit per clinic.
8. Patients who do not have a review date set on EMIS should be asked to make an appointment at the earliest opportunity.



# Appendix 5

## Data collection forms

### Clinical medication review – control group patients

Date of data recording .../.../...

<b>Name</b>	
<b>Address</b>	
<b>Date of birth</b>	
<b>EMIS identifier</b>	
<b>Study identifier</b>	

Date of last review ...../ ...../.....

Evidence for review since December 1998?      Yes/No      date ..... / ..... / .....

Overdue review?      Yes/No

Number of hospital admissions – acute since December 1998      .....

Number of hospital admissions – non-acute since December 1998      .....

Number or GP consultations since December 1998      .....

Suspected ADR [adverse drug reaction]s?      Yes/No      Number      .....

**Therapy on repeat prescription**

<b>Pre data</b>		<b>Start data</b>	
<b>Repeat drug</b>	<b>Dose</b>	<b>Repeat drug</b>	<b>Dose</b>

<b>Pre data</b>		<b>Start data</b>	
Number of repeats		Number of repeats	
Number of dose times		Number of dose times	

I have reviewed the following patient's medication at the medication review clinic. The following shows any repeat medications and my recommendations.

**Date of consultation:** ..... / ..... / .....

**Date of last review:** ..... / ..... / .....

<b>Name</b>	
<b>Address</b>	
<b>Date of birth</b>	
<b>EMIS identifier</b>	
<b>Study identifier</b>	

**Diagnoses listed in patient's notes**

- |    |    |
|----|----|
| 1. | 2. |
| 3. | 4. |
| 5. | 6. |

I recommend the following:

1.
----

Please indicate if:

- Satisfactory for pharmacist to go ahead and make the change [ ]
- Leave for GP to make change [ ]
- Notes: .....
- Do not accept recommendation [ ]
- If not, why not?

**Recent changes in existing conditions**

I recommend the following:

2.
----

Please indicate if:

- Satisfactory for pharmacist to go ahead and make the change [ ]
- Leave for GP to make change [ ]
- Notes: .....
- Do not accept recommendation [ ]
- If not, why not?
- Notes: .....

**New medical complaints**

.....  
.....  
.....  
.....

**Recent changes in existing medical conditions**

.....  
.....  
.....  
.....

**Symptoms that patient thinks may be due to medicines**

.....  
.....  
.....  
.....

Therapy on repeat prescription

Repeat drug	Repeats in December 1998	Dose	Indication	Notes	For office use only: Reason

Therapy taken regularly but not on repeat prescription


**Recommendations**

I recommend the following:

1.

Please indicate if:

- Satisfactory for pharmacist to go ahead and make change [ ]
- Leave for GP to make change [ ]

Notes: .....

- Do not accept recommendation [ ]

If not, why not? .....  
.....

2.

Please indicate if:

- Satisfactory for pharmacist to go ahead and make change [ ]
- Leave for GP to make change [ ]

Notes: .....

- Do not accept recommendation [ ]

If not why not? .....  
.....

3.

Please indicate if:

- Satisfactory for pharmacist to go ahead and make change [ ]
- Leave for GP to make change [ ]

Notes: .....

- Do not accept recommendation [ ]

If not why not? .....  
.....

4.

Please indicate if:

- Satisfactory for pharmacist to go ahead and make change [ ]
- Leave for GP to make change [ ]

Notes: .....

- Do not accept recommendation [ ]

If not, why not? .....  
.....

5.

Please indicate if:

- Satisfactory for pharmacist to go ahead and make change [ ]
- Leave for GP to make change [ ]

Notes: .....

- Do not accept recommendation [ ]

If not, why not? .....  
.....

6.

Please indicate if:

- Satisfactory for pharmacist to go ahead and make change [ ]
- Leave for GP to make change [ ]

Notes: .....

- Do not accept recommendation [ ]

If not, why not? .....  
.....

**Office use only:**

Number of repeats	
Number of dose times	
Cost of 28 days' repeats	
Consultation outcome	

**Pre-review data**

Evidence for review since December 1998	Yes/No	date .....
Hospital admissions, acute, since December 1998		.....
Hospital admissions, non-acute, since December 1998		.....
GP consultations since December 1998		.....
Suspected adverse drug reactions ?	Yes/No	What? .....
Repeat medication in December 1998:		
Number of medicines		.....
Number of different dosage intervals		.....
Cost/month (£)		.....



**Clinical medication review study: finish data**

Name	
Address	
Age	
Practice	

Intervention	Date seen
	...../...../.....
Control	Matched date
	...../...../.....

Dead	Date died ...../...../.....
Left list	Date left ...../...../.....

Intervention – no recommendation made	1
Intervention recommendation made	2
Control	3

**6-monthly patient assessment or matched period for control group**

Drug	Dose	Frequency	Monthly usage if p.r.n.	BNF code	Cost per month	Change in drug dose or frequency from start period 1-5 (see key)	Intervention patients only	
							Recommendation made and agreed? (Yes/No)	Outcome of recommendation? 1-3 (see key)

Number of repeats	Number of GP attendances due to clinical medication review clinic
Number of different dose frequencies	Number of GP attendances not due to clinical medication review clinic
Cost for 28 days	Number of hospital admissions
Documented doctor review? (Yes/No)	Number of hospital outpatient visits

Number of repeats	Frequency	Dose
Number of different dose frequencies		
Cost over 28 days	£	
Documented doctor review? (Yes/No)		

#### Data collection on 1 June 2000 (12-month period)

Drug	Dose	Frequency	Monthly usage if p.r.n.	BNF code	Cost per month	Change in drug dose or frequency from start period 1-5 (see key)	Intervention patients only	
							Recommendation made and agreed? (Yes/No)	Outcome of recommendation? 1-3 (see key)

Number of repeats	Number of GP attendances due to clinical medication review clinic
Number of different dose frequencies	Number of GP attendances not due to clinical medication review clinic
Cost over 28 days	Number of hospital admissions
Documented doctor review? (Yes/No)	Number of hospital outpatient visits

Number of repeats	Frequency	Dose
Number of different dose frequencies		
Cost over 28 days	£	
Documented doctor review? (Yes/No)		

**Key:**

***Change in drug, dose or frequency from start period***

1. Drug stopped
2. Drug changed
3. Drug same, dose changed
4. Drug same, formulation changed (including generic switch)
5. Drug same, dose frequency changed

***Outcome of recommendation***

1. Never changed
2. Changed but changed back/changed to something else
3. Remained changed



## Appendix 6

# Pharmacist's medication review: procedure for review and communications and record keeping

### Procedure for review

1. **Ensure appropriate indication for each drug with no unnecessary duplication.**
  - Determine if there was ever a valid indication or if the original indication is no longer valid.
  - Explore the possibility of discontinuation of the medication with the patient, through explanation and reassurance, and with the GP.
  - If acceptable to the patient and GP, stop unnecessary medication.
2. **Identify evidence for efficacy – question patient about efficacy and elucidate information from clinical record.**
  - If there is no evidence of efficacy, ensure that appropriate tests/investigations are conducted, when possible, by the pharmacist but, if necessary, by referral to an appropriate member of the team: for example, nurse for blood samples.
  - Follow-up the results.
  - Once results are known, suggest medication change if necessary.
3. **Opportunistic identification of unaddressed health problems.**
  - Refer to an appropriate member of the healthcare team, for example, GP or practice nurse, unless problem can be treated by pharmacist.
4. **Ascertain clinically relevant drug interactions or contraindications.**
  - Suggest suitable amendments to the therapy.
5. **Determine if the drug, dose or dosing schedule is the most appropriate, based on current evidence?**
  - If not, suggest evidence-based amendments to therapy.
6. **Is there a therapeutically equivalent but more cost-effective choice of medication for each indication?**
  - Is the alternative acceptable to both the patient and GP?
  - If the alternative is acceptable, agree the changes with the patient and, if necessary, the GP.
  - If monitoring of new therapy is required, ensure this is done; follow up results to ensure equal, or improved, efficacy and tolerability to previous medication.
7. **Enquire if patient is taking each drug regularly by the correct route, at correct dose and at right times.**
  - If the instructions are 'as required', determine if patient (or patient's carer) knows how it should be taken.
  - Suggest and agree corrective strategies with patient/carer.
8. **Ensure patient understands purpose of each drug and check whether he/she wants to carry on taking it.**
  - Suggest and agree corrective strategies with the patient/carer.
9. **Identify any other drugs (including over-the-counter drugs, alcohol and illegal drugs) that patient takes regularly.**
  - Record relevant drugs in patient's notes.
  - If interactions are present, suggest changes to therapy.
10. **Question patient about side-effects and identify potential side-effects from clinical record.**
  - If clinically relevant, record in notes and complete Committee for the Safety of Medicines yellow card.
  - Suggest corrective action.

## Communications and record keeping

1. Record details of the medication review in patient's notes.
  2. Seek permission from GP to make changes where necessary.
  3. Make changes to repeat prescribing systems.
  4. Ensure that patient understands purpose of new medication and which medications are to be stopped.
  5. Give patient a written copy of:
    - the name of drug\*
    - the strength, dose and frequency of administration\*
- the purpose of the medication
  - the date of prescribing\*
  - the review date\*
  - under what circumstances the patient should see the doctor sooner.
- (The points marked with an asterisk (\*) form part of the repeat medication request slip.)
6. Communicate important changes to other members of the healthcare team, including community pharmacists and patient carers.
  7. Set date for next medication review.

## Appendix 7

### Examples of interventions offered to GPs for agreement

The following are examples of the types of interventions that the research pharmacist may wish to make. Please indicate if you think it

would be acceptable for him to instigate a change with or without the GP's permission.

Intervention example	Satisfactory to change without GP's permission	Would need GP's permission
1. Changing the quantity on a repeat prescription.	<input type="checkbox"/>	<input type="checkbox"/>
2. Changing from branded to generic drug.	<input type="checkbox"/>	<input type="checkbox"/>
3. Changing the type of inhaler device for the same drug, e.g. fluticasone metered dose inhaler to fluticasone breath-actuated inhaler.	<input type="checkbox"/>	<input type="checkbox"/>
4. Changing from three-times-daily preparation to once-daily preparation to aid compliance.	<input type="checkbox"/>	<input type="checkbox"/>
5. Changing from co-codamil 30/500 to co-codamol 8/500 because patient suffering from side-effects at higher dose.	<input type="checkbox"/>	<input type="checkbox"/>
6. Increasing dose of warfarin because INR* too low.	<input type="checkbox"/>	<input type="checkbox"/>
7. Increasing the dose of an anti-hypertensive because blood pressure too high.	<input type="checkbox"/>	<input type="checkbox"/>
8. Starting aspirin in a patient with atrial fibrillation who has no contraindications.	<input type="checkbox"/>	<input type="checkbox"/>

\* INR, International Normalised Rate (used in measurement of blood clotting rate)





## Appendix 8

### Medication review clinic/home visit interview format

#### Semi-structured interview schedule

Hello, I'm ..... Thank you for agreeing to let me see you.

#### Explanation

The doctors are keen to ensure that your medicines are the best ones for you, and I am helping them to review treatments. I am seeing 1200 patients in four different practices as part of a study to see if a pharmacist can help patients with their medicines as well as doctors. You will still be able to see the doctor as well if you wish to.

I would like to ask you a few questions about your medicines.

#### Questions

Please can you show me the medicines that you **have**?

Who prescribes your medicines (GP, hospital specialist)?

Who monitors your medicines (GP, hospital specialist)?

Are there any additional medicines you buy from the chemist [pharmacy]?

Which ones do you **take**?

Have you noticed any change in your **existing** condition(s) since you last saw your doctor?

Do you have any **new** medical complaints?

Are there any symptoms that you think may be due to your medicines?

Do you have any complaints that you think are not being treated?

Do you have any other concerns that you would like to ask me about?



## Appendix 9

### Reasons why elderly patients declined to participate in the study

Patients who had not responded to the invitations to be included in the study were contacted by telephone (although see category 2 below). Patients were found to be less likely to agree to participate if they were older, female and

on only one or two repeat medications. Their reasons for not participating in the study could be broken down into ten broad categories, as detailed below. Full details have been published elsewhere.<sup>37</sup>

Category of response	Typical response
1. Nature of invitation letter	Poor eyesight led to difficulties in reading the letter. Letter misinterpreted to mean that patient would have to come to hospital or university, despite being written on practice headed notepaper. Patients failed to understand that, if they were housebound, they could be visited at home. Some thought study was a clinical trial of experimental medicines, despite the letter specifically stating that it was not this type of study.
2. Not contactable	Addresses on practice databases were not always complete; others lacked postcodes. Letters were returned marked 'Gone away'. Some patients had no telephone number recorded on practice databases.
3. Confusion or lack of understanding	Cognitive impairment resulting in confusion was apparent in some patients contacted by telephone. Deafness was a source of misunderstanding in some patients contacted by telephone. Patients who agreed to participate later telephoned the practice because they were worried about being included in the study or thought that they were being asked to visit the GP.
4. Unwell	Some patients said they were unable to participate because they were too unwell or they had just come out of hospital.
5. Unavailability	Patients said they couldn't attend because they were going into hospital or on holiday. Some were already in hospital. Some patients attended day centres and carers said they would not be available. Patients who followed a particular routine were often unwilling to change it in order to attend the interview. A few patients said that they were moving away from the area.
6. Impact on relationship with doctor	A few patients were under the care of consultants and thought that the consultant would be upset if the pharmacist made any changes to their medication. Some stated that their GP/consultant looked after their medication and saw no need for the pharmacist's review. A recent medication review by a consultant/GP was another reason for declining. Some patients were suspicious of the motives behind the study and thought that it might be a check on the GP's prescribing habits or would undermine the relationship with the GP.
7. Desire not to have medication changed	Patients who were content with their medicines as prescribed were concerned that the pharmacist might suggest that these were changed in some way.
8. Perceived simplicity of medication regimen	Some patients who had but one repeat medication did not want to waste the pharmacist's time. Others considered that, for example, as they 'only took aspirin', their medication requirements would be far too simple.
9. Negative attitude to healthcare	Some patients did not like any contact with the health system. Some had had bad experiences and others considered the healthcare system was not interested in elderly patients.
10. Mistrust of stated study objectives	Some patients were concerned that medicines they were happy with would be changed or stopped purely to save money for the NHS.



## Appendix 10

### Reasons for referral to GP as an outcome of the consultation

Patient Number	Reason for referral	Outcome
1977 1	Pernicious anaemia. Had vitamin B <sub>12</sub> injections up to 1996 then stopped. Referred to recommence injections	Restarted vitamin B <sub>12</sub> injections
363 2	Confusion over patient's antipsychotic and antidepressant drugs. Not enough known about patient history. Referred to GP for medication review	Dothiepin dose decreased from 150 mg to 75 mg daily
375 3	Patient stopped taking doxazosin because of adverse effects. Also suspected of being anaemic. Referred to GP to commence a new antihypertensive drug and to check high blood pressure	Seen by specialist and GP (three times). Doses of antihypertensive drugs increased and blood pressure controlled
381 4	Passed blood 3 weeks ago. Complained of some prostate symptoms, e.g. increased urinary frequency. Referred to GP for clinical review	Referred to urologist
1991 5	Had blood in motions. GP unaware. Referred for review	Reviewed
1505 6	Using glyceryl trinitrate three times per week. Last cardiologist review was 2 years ago. Referred for angina treatment review	Angitil dose increased from 120 mg b.d. to 180 mg b.d. No new appointment made
717 7	Referred for review of angina treatment	Reviewed
2166 8	Referred because uncertain whether he still had atrial fibrillation or whether this was a temporary problem post-operatively	No atrial fibrillation detected. Warfarin and digoxin discontinued
2009 9	Referred for review of loop diuretic and ACE inhibitor doses for cardiomyopathy	Reviewed
726 10	Patient complaining of erectile dysfunction. New problem	Referred to urologist
735 11	Taking alfuzosin for benign prostatic hypertrophy. Hospital had recommended trying it for 1 year and then stopping. Referred to GP with a view to stopping	Alfuzosin stopped
1672 12	Confusion over cardiac and asthma diagnosis. Referred to review medication in light of new diagnosis	Reviewed
827 13	Possibility that enalapril is causing erectile dysfunction	Viagra® (Pfizer Ltd, Sandwich, Kent) prescribed after referral to urologist
1679 14	Not taking prescribed ferrous sulphate because it causes diarrhoea. Suspicion that patient still anaemic. Also using a lot of glyceryl trinitrate	Patient had become hypotensive (owing to excessive usage of glyceryl trinitrate – as pointed out by pharmacist). Admitted to hospital and problem resolved
841 15	Being investigated for gastrointestinal bleeding but just been started on diclofenac. Referral with view to stopping diclofenac as a matter of urgency and replacing with a simple analgesic	Diclofenac stopped. Full blood count done twice. Patient's condition satisfactory

continued

Patient	Number	Reason for referral	Outcome
1181	16	Regular migraine (2–3 times weekly). Pizotifen taken as prophylaxis. Unable to take analgesic at time of migraine. Referred for treatment review with suggestion that Imigran <sup>®</sup> (GlaxoSmithKline, Uxbridge, Middlesex) nasal spray is prescribed	Migraine reviewed by GP. Imigran started. No further appointments made regarding migraine
1198	17	Amlodipine causing fluid retention during day followed by nocturia. Referred with view to changing amlodipine to something else	Switched to lacidipine. No ankle swelling
897	18	Referred for thyroid function tests. Hypothyroidism suspected	Unknown
1214	19	Ring worm had not improved with Daktarin <sup>®</sup> (Janssen-Cilag Ltd, High Wycombe, Bucks). Referred for review	Patient never went to GP
914	20	Left ventricular failure suspected. Referred for review with a view to starting frusemide and an ACE inhibitor	Not seen by GP
458	22	Patient stopped taking co-tenidone 4 months previously because of adverse drug reactions. No blood pressure check since. Referred for blood pressure check and starting treatment	Started on various drugs to control blood pressure. Also atrial fibrillation detected and treated
2319	23	Early menopause (aged 30 years). Not on osteoporosis prophylaxis	Calcichew <sup>®</sup> (Shire Pharmaceuticals Ltd, Basingstoke, Hants) prescribed
463	24	Duodenal ulcer in 1990. Not tested for <i>H. pylori</i>	Not done
1237	25	Started on paroxetine in 1998. No review since. Feels better. Referred for review of paroxetine treatment	Never went to GP
1845	26	Complained of loss of sight in right eye. Referred for clinic review	Seen by GP and optometrist
2053	27	Constipated (under review by hospital; ferrous sulphate may be contributing). Referred for haemoglobin test to see if ferrous sulphate still needed	Patient kept on ferrous sulphate
1733	28	Referred for review of uncontrolled angina	Seen by GP

*b.d.*, twice daily (*bis dies*)





# Health Technology Assessment Programme

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continued

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***We look forward to hearing from you.***

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