

Medication reviews

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Recent years have seen a formalization of medication review by pharmacists in all settings of care. This article describes the different types of medication review provided in primary care in the UK National Health Service (NHS), summarizes the evidence of effectiveness and considers how such reviews might develop in the future. Medication review is, at heart, a diagnostic intervention which aims to identify problems for action by the prescriber, the clinician conducting the review, the patient or all three but can also be regarded as an educational intervention to support patient knowledge and adherence. There is good evidence that medication review improves process outcomes of prescribing including reduced polypharmacy, use of more appropriate medicines formulation and more appropriate choice of medicine. When 'harder' outcome measures have been included, such as hospitalizations or mortality in elderly patients, available evidence indicates that whilst interventions could improve knowledge and adherence they did not reduce mortality or hospital admissions with one study showing an increase in hospital admissions. Robust health economic studies of medication reviews remain rare. However a review of cost-effectiveness analyses of medication reviews found no studies in which the cost of the intervention was greater than the benefit. The value of medication reviews is now generally accepted despite lack of robust research evidence consistently demonstrating cost or clinical effectiveness compared with traditional care. Medication reviews can be more effectively deployed in the future by targeting, multi-professional involvement and paying greater attention to medicines which could be safely stopped.

Introduction

Awareness of the need to reassess periodically treatment to monitor both beneficial and potentially harmful effects of polypharmacy was highlighted by Zermansky's 1990s primary care study which quantified for the first time the large numbers of patients whose long term medicines were not being reviewed year on year [1]. Understanding was also growing that a needs assessment was required not only when long term medicines were first started but regularly thereafter. Studies of the consequences of adverse effects of medicines have consistently shown over two decades that many hospital admissions are potentially preventable [2]. In hospitals, pharmacists have, since the 1980s, been reviewing medicines charts and making recommendations to prescribers. This peer review of doctors' prescribing (known as 'clinical pharmacy' in the hospital setting) generally did not, however, occur in primary care. In the UK the first pharmacists started to work in primary care medical practices in the late 1980s, and their work developed from analysis of prescribing data and advice on

cost management, into a clinical role involving first medication review and latterly, in some cases, independent prescribing. Government policy documents, including the National Service Framework for Older People [3], embedded medication review in primary care and led to its inclusion in the new General Medical Services contractual requirements in 2004 [4], and community pharmacy contracts in England and Wales since 2005 (Medicines Use Reviews) and in Scotland since 2010 (Chronic Medication Service). These examples represent a continuum of approaches ranging from a full clinical review to a more superficial check. These different approaches are described in more detail later in this article, focusing on UK primary care and drawing on published evidence from the UK and elsewhere.

Why medication use reviews are needed

A key function of medication review is to identify where adherence support is needed. We know that only

approximately 50% of long term medicines are actually taken as directed [5]. We also know that adherence generally decreases as the length of time a medicine has been taken increases. Adherence support needs to take account of the extent to which non-adherence is intentional and/or unintentional. Side effects are one of the influencers of adherence, and a key function of medication review is to assess whether side effects are happening. The National Institute for Health and Clinical Excellence (NICE) Guideline on Medication Adherence emphasizes the importance of a joint approach to medication review with the patient taking a full role to maximize best use of medicines [6]. Medication review is particularly relevant in polypharmacy (four or more long term medicines), especially in older people, where medicines are an important cause of unplanned hospital admissions. The use of such long term medicines is increasing, especially preventative medicines where adherence is particularly low. In addition, when patients taking many medicines visit their primary care doctor, the consultation usually focuses on one or two of their conditions and there is insufficient time for an overall review of all medicines.

What is meant by ‘medication review’?

The overall aim of medication review is to improve the quality, safety and appropriate use of medicines. ‘Medication review’ is an umbrella term which encompasses a number of interventions that might be carried out by prescribers themselves (self-review by doctors, pharmacists, nurses) or by other practitioners providing advice to prescribers (independent review, usually done by pharmacists). This article focuses on the latter. The three types of review described by Medicines Partnership [7] have become widely cited: Prescription review, Compliance and concordance review and Clinical medication review (see Table 1)

Clinical medication review was first defined by Zerman-sky *et al.* as ‘the process where a health professional reviews the patient, the illness, and the drug treatment during a

consultation. 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 when appropriate. The outcome of the review will be a decision about the continuation (or otherwise) of the treatment’ [8]. Medication review is, at heart, a diagnostic intervention which aims to identify problems for action by the prescriber, patient or both but can also be regarded as an educational intervention to support patient knowledge and adherence. The balance of these elements varies in practice and the boundaries between the three types of review are not clear cut. Table 2 shows the reviews currently being provided in NHS care in the UK. In all of these cases, the patient is involved in the review.

To refine further the definition of a clinical medication review, it has been suggested [11] that it should:

- Check whether the patient still needs to be on all of their medicines
- Find out whether the medicines are helping the patient
- Find out whether the medicines are causing harm or risk to the patient
- Explore whether the patient is happy to continue to receive and take the medicines
- Find out whether the patient should be offered any additional medicines for treated or untreated conditions.

The General Medical Services (GMS) contract advises medication review (‘clinical medication review’) should be undertaken every 15 months for all patients being prescribed repeat medicines. Reviews may be conducted by a GP, a practice-based pharmacist or a practice-based nurse. A review ‘may not always necessarily be a face to face review. It is possible to review the patient’s repeat prescriptions in some circumstances without seeing the patient face to face, e.g. by telephone review or a review of the records’. [4]

A key benefit of fully involving the patient in a medication review is that this can support and facilitate ‘partnership in medicine taking’ (see ‘Prescribing and partnership with patients’). Medicines review with full input from the

Table 1

Types of medicines review (Medicines Partnership, 2008) [7])

Type	Scope	Method
Prescription review	Practical medicines management issues that can improve the clinical and cost-effectiveness of medicines and patient safety	Usually without patient present
Compliance and concordance review	Explore medicine taking including the patient’s pattern of medicine taking and beliefs about medicines	With patient present
Clinical medication review	Consider treatment in the context of the patient’s underlying condition and symptoms.	With patient present and with access to patient’s medical notes and laboratory test results

Table 2

Medication reviews in the National Health Service

Review type	Conducted by	Purpose
Medicines Use Review (MUR)	Community pharmacists in England and Wales	'Helping patients use their medicines more effectively. The pharmacist will perform a MUR to help assess any problems patients have with their medicines and to help develop the patient's knowledge about their medicines. Recommendations made to prescribers may also relate to the clinical or cost effectiveness of treatment' [9].
Dispensing review of use of medicines (DRUM)	Dispensing practices (by GP or dispenser)	'Help patients understand their medicines and to identify medicines-related problems'.
Chronic medication service	Community pharmacists in Scotland	'Pharmaceutical care of patients with long term conditions. It introduces a more systematic way of working and formalizes the role of community pharmacists in the management of individual patients with long term conditions in order to assist in improving the patient's understanding of their medicines and optimizing the clinical benefits from their therapy'. It involves patients registering with a pharmacy of their choice. The pharmacist identifies and records the patient's pharmaceutical care needs, care issues, any desired outcomes and the actions required to deliver those outcomes, and documents these in a pharmaceutical care plan.
Comprehensive medication review (Hospital)	Hospital pharmacists	'Distinct from the more routine review of drug charts that pharmacists make on ward visits. Can take place at any point during the hospital stay, generally when there is a concern about potential interaction of medicines or the patient has not been responding to their medication as expected' [7]. Often conducted as part of medicines reconciliation when a patient is admitted to hospital.
Clinical medication review	GP practice-based pharmacists; Community pharmacists;	'A structured, critical examination of a patient's medicines with the objective of reaching an agreement with the patient about the continued appropriateness and effectiveness of the treatment, optimizing the impact of medicines, minimizing the number of medication related problems and reducing waste'. 'The pharmacist will provide further advice and support regarding the patient's use of medicines and, where appropriate, will refer the patient to another health care professional' [10].

patient may lead to 'an agreement to differ' where the desired prescribing and clinical outcomes (from a professional perspective), are not achieved. However, this is the appropriate outcome for that patient.

Community pharmacists in England and Wales provide 'medicines use reviews' (MURs) as part of their NHS contract. The pharmacist has to be accredited to provide MURs and the pharmacy premises must have a consultation area that meets NHS standards of privacy. The focus of MURs is on establishing how the patient is using (or not) their medicines and covers both prescribed and non-prescribed medicines. MURs are now targeted towards particular patient groups and core groups include those taking 'high risk' medicines, e.g. warfarin, those with asthma/COPD and those recently discharged from hospital. Dispensing practices provide DRUMs (Dispensing Review of Use of Medicines) which, like MURs, have a focus on the patient's use of medicines. In Scotland a similar service, the Chronic Medication Service (CMS) is part of the core community pharmacy contract. It has a slightly more holistic remit than the MUR service, delivering a full pharmaceutical care assessment, plan and implementation. It also includes the use of serial prescriptions to allow repeat prescribing of long term medication and communication and data storage is all electronic, with transfer of information between GP and pharmacist.

Thus, medication review has been formalized in NHS contracts extensively in the UK with an underlying presumption that all patients on medication for long term conditions should have at least an annual review. Other

countries have taken different approaches. In Australia the model is of 'Collaborative home medication reviews (HMR)' where patients whose treatment appears in need of review are identified by a GP or community pharmacist and joint patient outcomes agreed as goals of the review. Medicines information is shared by the GP with the pharmacist, who visits the patient in their own home (or in a care home) to conduct the review and then reports back to the GP. Medication Therapy Management (MTM) services in the US include reviews of patients' medicines by community pharmacists and other service providers.

Effectiveness of medication reviews

This section traces the introduction and development of medication review in UK primary care drawing on published systematic and structured reviews of relevant literature and the authors' own literature collections supplemented by structured searches to ensure currency. Work in general practices in Dundee, Scotland during the 1990s was one of the earliest examples of a robustly evaluated systematic approach to medicines management in primary care based on medication review [12, 13]. Building on the 'clinical pharmacy' role pharmacists had in hospitals, experienced hospital pharmacists worked with GPs to review prescribing of sub-groups of the registered patients receiving treatment for certain targeted conditions. In one of the earliest examples of such a service, all patients receiving ulcer healing medicines were reviewed jointly by

the pharmacist and the GP and those with no recorded diagnosis or no recent ordering of the drug had their repeat discontinued. All other patients were invited to attend a clinic where they were reviewed by the pharmacist and subsequent treatment was in accordance with guidelines agreed with the GP. As a result overall expenditure on this group of drugs in one general practice fell at a time when it was generally rising elsewhere [12]. The same team reported similar benefits for pharmacist led warfarin clinics [13]

Subsequently medication review by an emerging group of UK primary care pharmacists became a well established service despite little strong evidence of health economic benefit [14]. Whilst many trials reported benefits in one or two parameters few would meet current methodological standards and only one early US study included a cost analysis which showed a small per patient saving [15].

There is now good evidence that medication review improves process outcomes of prescribing such as reduced polypharmacy, more appropriate formulation, and more appropriate choice of medicine [8, 16–18] and that GPs have accepted and implemented high percentages of such changes recommended by pharmacists in the UK [8, 16–18] and in Australia [19, 20]. There is an increasing call for evidence of the benefit of medication review using longer term clinical outcomes. When 'harder' outcome measures have been included such as reduced hospitalizations or mortality in elderly patients a systematic review concluded that whilst interventions could improve knowledge and adherence they did not reduce mortality or hospital admissions with one study showing an increase in hospital admissions [21]. Another review likewise concluded limited benefit [22]. There is debate, however, about whether total hospital admission numbers are an appropriate outcome measure for medication review and an analysis of the causes of admission in a cohort of patients found that only one in five were considered to be related to medicines and only one in 10 were judged possibly preventable by pharmacist intervention [23].

A similar picture has emerged for medication reviews conducted in institutional settings with a review concluding that whilst the interventions reduced prescribing there is still a need for evidence to demonstrate benefits related to health care costs and patient outcomes [24]. An exception to the overall conclusion of the review is a UK paper which studied pharmacist led medication review for elderly people living in care homes and showed a reduction in falls but no change in hospitalization, mortality or other validated patient scales [16].

Robust health economic studies of medication review remain rare but a review of cost-effectiveness of medication reviews concluded 'there were no reports of studies in which the cost of the intervention was greater than the benefit, and several reported a cost saving when measuring drug cost change only' [25]. A cost consequences

analysis of a targeted service where pharmacists conducted a medication review in the patient's own home found that costs were offset by reductions in emergency hospital admissions and in medicines costs [26]. A large UK study (PINCER study) compared simple computerized feedback to GPs about patients at risk of potentially hazardous prescribing with a joint review of the feedback by pharmacist, GP and other members of the practice team [27]. The study included a full economic analysis and the results indicated that the intervention reduced the risk of prescribing and monitoring errors for NSAIDs, β -adrenoceptor blockers and ACE inhibitors 6 months post intervention.

In common with much research there are indications that moving from studies of medication review with relatively small sample sizes and often a single (or a small number) of highly trained committed pharmacists, to wider implementation to more patients and more pharmacists, there is a dilution of effect. For example, the Community Pharmacy Medicine Management study was a randomized controlled trial to test the effect of medication review on clinical indicators in patients with coronary heart disease involving 1493 patients, 62 community pharmacists and 164 GPs. Patients' treatment was reviewed by the community pharmacist in the pharmacy setting in a model that in some ways was a forerunner to MURs. Despite increased patient satisfaction in the group receiving the intervention and recommendations for medication change in line with previously published work [28], there were no improvements in any of the clinical indicators [29]. The performance of individual community pharmacists in the Community Pharmacy Medicines Management Study showed considerable variation [28], also a finding in another multi-pharmacist study [30]. In New Zealand a randomized controlled trial of community pharmacist conducted medication review found improved Medication Appropriateness Index (MAI) in the intervention group but withdrawal of one in three study pharmacists from the study raised questions about generalizability [31].

There have been few studies of the effectiveness of MUR and a review concluded that 'studies evaluating directed MUR services, focusing on a particular disease, were most likely to report clinical outcomes' [32]. In contrast the HMR service in Australia has been the subject of several substantive studies which have demonstrated effectiveness in preventing, detecting and resolving medication-related problems [20] and cohort studies in Australian veterans have shown reductions in hospitalizations associated with heart failure [33] or warfarin [34–36].

Despite much of the groundbreaking work in primary care having been led by hospital pharmacists there are few studies of medication review in hospitals. A Cochrane review is ongoing and the results should be of wide interest (medication review of hospitalized patients to prevent morbidity and mortality: Effective Practice and Organization of Care group <http://www.epoc.cochrane.org>).

In summary recent years have seen a formalization of medication review by pharmacists in all settings of care. The value of this service is now generally accepted despite lack of robust research evidence consistently demonstrating any cost or clinical effectiveness compared with traditional care.

Factors affecting the quality and effectiveness of medication use reviews

Authors of evidence reviews in clinical medication reviews and MURs have identified the key explanatory factors that impact on quality and effectiveness and account for the inconsistent benefit shown in studies:

- the quality of the recommendations made by pharmacists improves when pharmacists have more patient information [37]
- without a good working relationship between the clinician and pharmacist, the impact of pharmacist medication review is reduced and may be minimal [21, 37]
- written recommendations from a pharmacist to a clinician, in the absence of other forms of communication, have limited effect [37]
- other pharmacist interventions with similar components have been effective when pharmacists form part of a team [21]
- variation in the consultation skills of practitioners conducting medication review [7].

In reviews undertaken in the community pharmacy setting the pharmacist can refer to their computerized patient medication records (PMRs) and can consult with the patient for further information. For a MUR where the focus is on practical use of medicines this may be sufficient. These sources are not adequate for a clinical medication review, where access to the patient's notes is needed. Community pharmacists usually do not have such access (with a few exceptions where the pharmacy and surgery are electronically linked). Some community pharmacists also do sessional work as practice based pharmacists and may undertake clinical medication review in these practices.

Frequency of review may also be important but it is the follow-up actions that are more likely to be critical. The MUR is a single intervention intended to be conducted annually with implications for potential impact as a stand alone service. The lack of dialogue between community pharmacists and GPs is well recognized as a limitation of the MUR process. However the potential for MURs to assist in improving patient outcomes is considerable and their core purpose, to improve patients' understanding of their medicines, is clinically important [38]. Although clinical medication review undertaken within the GMS contract is

also an annual review it is undertaken in the practice setting where the practice pharmacist has access not only to patient notes but also to other health professionals with whom necessary communication and changes are more easily implemented.

Acceptance of treatment recommendations made by pharmacists in medication reviews is fundamental to improving treatment quality. However prescribers' levels of agreement with, and changes made as a result of the recommendations have varied markedly in studies. The relationship between the prescriber and the practitioner conducting the review is now recognized to be critical. Acceptance of the need for review and trust in the practitioner doing the review is essential to open dialogue about recommendations to prescribers that may result. As described earlier the benefits of medication review can be maximized by full involvement of the patient but as this may lead to an 'agreement to differ' where the desired prescribing and clinical outcomes (from the professional perspective) are not achieved, measuring the effectiveness of medication reviews only on the basis of adherence will not give the full picture.

Knowledge and skills to build on pharmacists' knowledge of medicines and underpin medication review include consultation skills, use of clinical records and communication of issues and recommendations arising from the reviews. Community pharmacy service specifications for medication review in different countries, including within the UK, require training and accreditation. Many of the published studies referred to in the effectiveness section of this paper stated that additional training was a pre-requisite of participation. In addition, the increasing cadre of pharmacists who have completed qualification as an independent prescriber will have received consultation skills training and will also have the ability to make changes without reference to the prescriber who initiated the therapy.

The future of medication use reviews

There are three key ways in which medication reviews can be more effectively deployed in the future: targeting, multi-professional involvement and paying greater attention to medicines which could be safely stopped.

There are already some moves towards more effective targeting of the resource invested in medication reviews to patients whose need is greatest. However this process needs to develop at GP practice level and an analysis of the effects of the Quality and Outcomes Framework (the QOF, which has been part of the general practice contract since 2004) on the quality of care concluded that 'although there is ostensibly an annual medication review target in the QOF, it is doubtful that this really stimulates meaningful

risk benefit analysis and rationalization of medicines in older people with multiple diseases' [39].

Evidence from Australia provides a strong indication that pharmacists and prescribers in primary care need to work more closely together if the potential benefits of medication use reviews are to be realized. In a forthcoming randomized controlled trial of a multi-professional medication review service (MMRS) pharmacists, pharmacy technicians, care home staff and the GP(s) responsible for the medical care of residents will take a team approach, meeting together to review and discuss the medications of care home residents [40]. Community pharmacist involvement in reviews post discharge is now a focus of the MUR service in England and Wales and will require a step change in communication not only between community pharmacist and GP but also between hospitals and their community pharmacist and GP colleagues.

Recent work on 'deprescribing' with MUR as the means to identify treatments that can be stopped is ripe for further study [41]. Monitored withdrawal of medicines known to be associated with adverse effects has the potential to both improve patients' quality of life and reduce unnecessary resource use. A pilot randomized controlled trial showed sufficiently promising results, with greater reductions in prescribing in the intervention group [42], to warrant larger studies.

Conclusions

Medication review is now a well established part of UK primary care based on evidence of reductions in polypharmacy and increased appropriateness of prescribing. A key outcome has been a greater use of, and thereby recognition of the skills of, pharmacists attached to general practices and in community settings. Reviews conducted by community pharmacists in the pharmacy setting will require more formal systems for linkage to GPs if they are to achieve their potential. This, together with targeting of patients who are prescribed medicines associated with higher risk of hospital admission and morbidity and the proactive identification of medicines that could be withdrawn, will offer further improvements in effectiveness.

Competing Interests

DKR is co-founder and academic advisor to Luto Research Ltd, which develops, refines and tests patient information materials.

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