Medication review and reconciliation in older adults

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Abstract

Older people are frequently exposed to polypharmacy, inappropriate prescribing, and adverse drug events. Two clinical processes can help geriatricians to optimize and increase the safety of drug prescriptions for older adults: medication reconciliation and medication review. Medication reconciliation provides the best possible medication history and identifies and resolves discrepancies in drug prescriptions. During the medication review, the best possible medication history is crosschecked against other data, including morbidities, patient's preferences, or geriatric syndromes, to produce a personalized medication strategy. Alignment of treatment recommendations with patient preferences and goals through shared decision-making is particularly important in medication review. Medication reconciliation and medication review have proven to be effective, but their broad implementation remains difficult. Indeed, these procedures are time-consuming and require specific skills, coordination between different healthcare professionals, organizations and dedicated means. The involvement of geriatricians therefore remains essential for the successful implementation of medication reconciliation and medication review in geriatric settings and among frail older people.

Keywords: medication reconciliation, medication review, older people, geriatrics, patient perspective, CDSS

Key summary points

Aim: This review article describes medication reconciliation and medication review processes, their effectiveness among older people, and the implementation issues in daily practice.

Findings:

- Medication reconciliation and medication review are two distinct but complementary clinical processes that may be efficient to decrease drug related problems and prevent adverse drug events
- Effectiveness and successful implementation of medication reconciliation and medication review require cautious acknowledgement of human factors and organizational issues and alignment of treatment recommendations with patient preferences and goals

Message: The involvement of geriatricians remains essential for the successful implementation of medication reconciliation and medication review in geriatric settings and thus better drug risk management for older patients.

1) Introduction

The prescription and management of medications for older patients (especially those who are frail) constitute a particular challenge. The presence of multiple comorbidities means that polypharmacy is frequent among older adults [1, 2]. In turn, this leads to inappropriate prescriptions, adverse drug events (which tend to be more serious than in young adults), and elevated costs. Procedures have been developed for optimizing and increasing the safety of drug prescriptions for older adults. In particular, two complementary actions have been widely evaluated: medication reconciliation (MedRec) and medication review (MedRev) [3–7].

Furthermore, the rapid, massive computerization of prescription data (part of the move towards large-scale digitization of healthcare data in general) has prompted the development of informational technology (IT) tools that can help healthcare professionals to implementing MedRec and/or MedRev. However, MedRec or MedRev are procedures involving several healthcare professionals, leading to organizational issues that cannot be solved uniquely through IT tools. Thus, the human factors related to these procedures must be taken into account so that the implementation of MedRec and/or MedRev truly optimizes drug prescriptions for older patients.

Here, we describe first MedRec - now an essential process in the care of older patients – and then MedRev. We then review MedRev's effectiveness and its associated procedures. The importance of the patient's perspectives and issues related to shared decision-making will be explored. Next, we describe the opportunities and difficulties related to the development and use of IT tools for facilitating MedRec and MedRev in clinical practice. Lastly, we show that human factors have an essential role in the implementation and performance of MedRec and MedRev.

2) Medication reconciliation

MedRec has been defined as "a process of identifying the most accurate list of all medications a patient is taking — including name, dosage, frequency, and route — and using this list to provide correct medications for patients anywhere within the health care system" [8]. The three major steps in MedRec are (i) establishment of the best possible medication history (BPMH); (ii) comparison of the BPMH with current and/or planned prescriptions, in order to identify and resolve discrepancies; (iii) communication with the appropriate caregivers and thus the initiation of relevant clinical decisions. The BPMH should be built by gathering data from at least three different sources from among the patient, caregivers, prescriptions, electronic or paper-based medical records, the community pharmacist, the general practitioner, community nurses, or other sources such as the contents of patient medicine bags. The BPMH can be used to identify and correct drug discrepancies, or to support more complex procedures for medication optimization (such as MedRev, described below).

MedRec should be performed at all care transitions, in order to avoid medication discrepancies (e.g. omissions, duplications, or dosing errors). Although it has been shown that MedRec is an effective means of reducing potentially harmful medication errors [3, 4, 9, 10], there is little evidence to indicate that MedRec *per se* improves clinical outcomes [4, 11]. However, MedRec is not just a means of reducing medication errors: it is also the basis for nearly all medication management or optimization procedures. Consequently, the question is no longer whether or not MedRec should be implemented but rather how it can be implemented more widely.

There are many international guidelines for conducting MedRec, including those issued by the World Health Organization, the Institute for Healthcare Improvement, and the UK National Institute for Health and Care Excellence (NICE). Furthermore, many national pharmaceutical societies provide guidelines (written in English or in the local language(s)), practical tools and educational support for

MedRec implementation. Clinical pharmacists often support the implementation of MedRec in geriatric medicine departments because of the high prevalence of polypharmacy, the frequency of medication discrepancies in geriatric settings, and the high risk of adverse drug events in older patients. In this regard, the geriatricians' awareness of the importance of medication management facilitates collaboration with pharmacists. Furthermore, national and international initiatives have promoted the development of MedRec among elderly adults and thus in geriatrics [12, 13]. These initiatives and actions should facilitate the broad dissemination and implementation of MedRec in geriatrics. However, MedRec is time-consuming and requires expert pharmacy skills. Even though pharmacy technicians can be involved in certain tasks, the full MedRec process requires teamwork by the hospital pharmacist, the attending physician, and the patient [3, 4, 14]. The broad implementation of MedRec therefore raises questions about task organization and the adequacy of human resources for the intended procedures. Human and organizational factors have important roles (see below) and must be anticipated for the broad, sustainable implementation of MedRec [15]. Contextual factors (organizational capacity, leadership support, goal alignment, staff involvement, the patient safety environment, and team cohesion) should be clearly identified and documented [16].

3) Medication Review

MedRev is recommended for reducing the frequency of inappropriate polypharmacy and related adverse health outcomes in older patients [7, 17–19]. This procedure can be performed in an acute situation (e.g. during a hospital stay) or periodically to reassess the benefits and harms associated with chronic medication.

There is no generally accepted definition of MedRev. The UK NICE defines MedRev as "a structured, critical examination of a person's medicines with the objective of reaching an agreement with the person about treatment, optimising the impact of medicines, minimising the number of medication-related problems and reducing waste" [20]. In practice, MedRevs can vary in their scope and level of detail, ranging from prescription reviews (usually without the patient's involvement) to full clinical MedRevs (with all the available clinical data and with the patient) [21].

Along with the information gathered during MedRec (i.e. all the prescription, over-the-counter and complementary medicines taken by the patient), the reviewer should also take account of (i) the patient's and carer's views, knowledge and questions about their medicines, (ii) the safety of each drug considered and compliance with use in the patient population, (iv) the patient's risk factors for developing adverse drug events, and (v) the potential requirement for monitoring [20]. In older patients (and particularly geriatric populations), comorbidities and frailty should be carefully evaluated. Indeed, multimorbidity and geriatric syndromes (such as falls, dementia, depression, and dependency) have been linked to a higher risk of adverse drug events [22]. MedRev may be performed by a single reviewer (a physician, pharmacist, or a trained healthcare professional) or a multidisciplinary team. With these aspects in mind, the medication reviewer does more than simply detecting potentially inappropriate prescriptions (PIPs); in collaboration with the patient, he/she elaborates a personalized medication strategy.

MedRev can be applied to all types of patients. However, MedRev is particularly important among older populations for several reasons: polypharmacy, chronic disease, a higher risk of adverse drug events (ADR) (drug-related admission is an important cause of unplanned hospitalisation in this population [23]), and, importantly, the heterogeneity of the population. More than ever, "one size fits all" is not applicable to older patients. MedRev in a frail, institutionalized patient and in an independent, robust patient will obviously not lead to the same recommendations. Importantly, the process of MedRev in older patients should take account of drug-drug interactions related to

polypharmacy, address the question of possible non-adherence (intentional and non-intentional), and consider the presence of geriatric syndromes. In older adults with multiple comorbidities, MedRev should undeniably be patient-centred by incorporating patient preferences into treatment decisions via shared decision-making (SDM) [18, 24]. The patient's personal health goals will fundamentally shape the recommendations and treatment modifications that follow the MedRev.

By definition, a MedRev should be structured. To support the MedRev process and detect PIPs, the clinician can use explicit (criterion-based) tools, implicit (judgement-based) tools, or both [25]. Explicit prescribing criteria for the detection of potentially inappropriate medications (PIMs, i.e. over- and misprescribing) and potential prescribing omissions (i.e. underprescribing) are based on the patient's drugs and (in some cases) diseases. One of the most widely used explicit tool in Europe is the Screening Tool of Older People's Prescriptions/Screening Tool to Alert to Right Treatment (STOPP/START) criteria, developed by expert consensus in Ireland after a review of the evidence [26–28]. Numerous other lists of explicit definitions of potentially inappropriate prescriptions exist and are widely used, such as the Beers criteria, the Forta list, the PRISCUS list, the NORGEP criteria, or the Laroche list [29–33].

Implicit tools may question several aspects of prescribing, including the choice of compound, dosage, indication, administration route, treatment duration, ADRs, drug-drug interactions, drug-disease interactions, duplication costs, adherence, and patient preferences. The Medication Appropriateness Index appears to be the most comprehensive, validated implicit tool currently available [34]; however, it takes longer to administer than explicit tools and is difficult to apply in routine clinical practice.

The increasing use of electronic medical records and electronic prescribing has led to the development of clinical decision support systems (CDSSs) based on algorithms adapted from explicit criteria. These systems can automatically detect PIPs and prompt a MedRev. The implementation of explicit criteria and the development of these algorithms is challenging [35]. However, a growing body of evidence suggests that these approaches are valuable and complement those based on implicit MedRev [20, 36].

The impact of MedRev has been studied over the last few decades. A core outcome set describes outcomes of relevance for clinical trials in older adults with multiple comorbidities and polypharmacy: drug-related hospital admissions, drug overuse, drug underuse, PIMs, clinically significant drug-drug interactions, health-related quality of life, and pain relief [37]. Several studies have highlighted the impact of PIP screening tools. A number of randomized clinical trials applied explicit criteria (such as STOPP/START, Beers, FORTRA or ACAT criteria) to their older participants and demonstrated a significant increase in prescribing appropriateness and reductions in adverse drug events, polypharmacy, falls, and costs [28, 38–43]. As mentioned above, MedRev goes beyond the detection of PIPs and yields a broader spectrum of recommendations.

Several studies have shown that MedRevs reduce inappropriate prescribing [21]. According to a systematic review and meta-analysis, isolated MedRev interventions improve medication-related outcomes: a decrease in the number of drug-related problems, a change in the number of medications, and the number of drugs with a dosage decrease [44]. However, no evidence of an impact on clinical outcomes (mortality, readmissions) or quality of life was found, and the reduction in the number of falls was minimal [44]. Although this systematic review did not focus on older patients, the mean participant age was over 75 in most of the included studies. A 2016 Cochrane review concluded that MedRev in adults can reduce attendance at the emergency department but did not evidence an impact on mortality or hospital readmission [7]. Interestingly, the reduction on emergency department visits was greater among high-risk groups, such as older adults and patients with polypharmacy. Given the

short follow-up period and interstudy heterogeneity, the Cochrane review's authors stated that important treatment effects might have been overlooked and that high-quality trials with a follow-up of at least 12 months are required to provide more definite evidence of the impact of MedRev on clinically important outcomes. Two large, ongoing, European, randomized clinical trials with long-term follow-up (SENATOR and OPERAM) have been designed to evaluate the relationship between MedRev and hard outcomes; the results are expected at the end of 2020 [45, 46].

4) The patient's perspective

A paradigm shift (from a disease-centred approach to a patient-centred approach) has been advocated as essential for improving outcomes in multi-morbid older patients [18, 47–49]. The question "what matters to you?" embraces the concept of patient-centred care, communication and SDM as a way of operationalizing this paradigm shift [50–52].

Alignment of treatment recommendations with patient preferences and goals through SDM is particularly important for MedRev and for reducing the extent of inappropriate polypharmacy in older adults [24, 51, 53]. Most decisions about stopping, starting, continuing, modifying or selecting medications in MedRev in older people with multiple comorbidities are preference-sensitive. The level of evidence on the benefit-harm ratio of most medications is low in this patient population. Hence, treatment conflicts, the treatment burden and the prognosis should be considered during the decision process, in order to minimise the burden of care and harms associated with overtreatment [18, 24, 48, 53, 54]. SDM results in better informed patients who tend to choose more conservative options (e.g. more medication stops, more dosage decreases, fewer medication switches, and fewer medication starts); this facilitates deprescribing and potentially reduces the treatment burden [24, 55, 56].

However, allowing patient preferences to guide treatment decisions is not yet standard clinical practice. Commonly cited barriers from the clinicians' perspective include time constraints, feeling uncomfortable about starting a conversation about preferences, and lack of agreement between SDM and the clinical situation - suggesting that clinicians presume that many patients will not benefit from SDM or will not wish to participate [52, 57]. Patients differ in the extent to which they want to participate in SDM [58]. The literature consensus is that most older patients want to participate in SDM but they are often not encouraged or allowed to do so [59]. A systematic review of patient-reported barriers to SDM showed that certain factors are much more prominent than the patient's will to participate; these include patient knowledge, a power imbalance in the patient-clinician relationship, and the clinician's interpersonal skills (empathy, listening, respecting patients' concerns, building trust) [52]. Furthermore, SDM for older adults with cognitive impairment or low health literacy provides an extra challenge. People with mild cognitive impairment and mild to-moderate dementia may still be involved in decision making regarding their medications and tools are being developed to support this process [60, 61]. Moreover, the presence of a companion in the consultation can facilitate involvement in decision-making whereas not having a companion present can act as a barrier [52]. Yet it is important to be aware of potential discordances between patients' care objectives and those of companions and clinicians [62, 63].

After eons of deeply engrained paternalistic practices, implementing with SDM requires significant behaviour changes by both clinicians and patients. A combination of interventions at the macro, meso and micro levels is needed to foster cultural and attitudinal changes to SDM: these include training healthcare professionals in SDM, preparing patients and carers to engage in SDM, developing SDM tools, and promoting a patient-centred culture [47, 59, 64, 65].

5) IT tools

Many different information technology (IT) tools have been developed to help healthcare professionals implement MedRec and MedRev and carry out some of the tasks [36, 66]. For example, IT tools can automatically compose and process the list of a patient's drug prescriptions and thus provide an initial BPMH [67]. This approach can increase the frequency of MedRec within an institution. However, the development of these tools requires the resolution of local regulatory, administrative, technical, IT and policy issues [67]. Other IT solutions can be used to facilitate patient involvement, patient validation of the BPMH [68, 69] and comparison of the BPMH with the list of current prescriptions [70] , although these IT solutions have been mainly tested among people without cognitive impairment. These tools improve the ability of MedRec to effectively identify and resolve drug discrepancies but do not seem to have an effect on clinical outcomes [71–73]. The use of automatic data collection tools is associated with an increase in MedRec implementation [67]. However, IT tools raise issues with regard to data access, interoperability, confidentiality, usability, ergonomics, and implementation within existing IT systems [66]. Successful implementation of electronic MedRec support tools requires a favourable context, proper design, and attention to implementation features.

Fewer IT tools have been developed to support healthcare professionals with MedRev, despite the fact that these tools do seem to improve MedRev performance [74]. These tools should be based, however, on validated expert guidelines (such as the STOPP/START criteria). The implementation of these guidelines is not straightforward and raises technical difficulties related to interoperability, data quality, data coding, and cross-referencing (to detect at-risk situations) [35]. The criteria are not always fully explicit and their translation into algorithms and computer code typically requires a lot of multidisciplinary work [35, 75]. Lastly, it should be noted that the guidelines change frequently and the lists of PIPs are regularly modified - requiring frequent updates of the corresponding IT tools. The evaluation of two different IT tools for MedRev among older patients is ongoing in the European SENATOR and OPERAM studies [46, 76].

Furthermore, CDSSs have been developed to flag up drug-related risk situations in real time. These tools are not directly dedicated to MedRec or MedRev but can identify patients at risk of an adverse drug event. However, the development of a CDSS is complicated by the same issues of data quality, interoperability, detection rule coding, and alert validity [77]. Studies have shown that CDSSs are still not sufficiently relevant and, in particular, lack specificity. According to two studies, only 3.6% and 7.8% of the respective alerts were considered to be clinically relevant [78, 79]. However, a systematic review of the literature on CDSSs in elderly subjects found an effect on reducing PIPs but not on improving clinical outcomes [36].

Hence, a range of IT tools is now available for helping healthcare professionals but implementation is not straightforward. The choice of IT solutions for assisting with MedRec or MedRev should therefore be driven by the needs expressed by healthcare professionals, local IT resources, and institutional or territory-wide policies.

6) Human factors

Although MedRec and MedRev are (at first sight) conceptually uncomplicated, some organizations struggle to operationalize them for a variety of reasons [80, 81]. As mentioned above, medication management can be complex and unpredictable; clinicians must often contend with fragmented IT systems and challenging technology designs. It should be borne in mind that healthcare systems differ in their resources and physical environments [82]. In turn, this can lead to a great variety of possible implementations (i.e. organization processes) for MedRec and MedRev.

MedRec and MedRec are complex, resource-intensive procedures that are embedded in larger sociotechnical systems. Although MedRec and MedRec are separate processes, they are often performed in concert; this requires a team-based approach if it is to be effective. These highly collective tasks are sometimes performed in uncertain, changing environments. The settings, needs, and the composition of the implementing team may change. Communication between healthcare teams across time or functional boundaries may be unclear. Multidisciplinary teams often have their own distinct routines, work processes, and habits that supports the work that is accomplished together. Coordination activities are therefore essential - especially for handling unexpected events and raising awareness among clinicians [83]. Team cohesion is the cornerstone of effective coordination between members [84, 85].

In this context, the initial organizational choices when implementing MedRec and MedRev processes are decisive; they must help healthcare teams to coordinate their activities and build positive personal relationships. However, data on broadly applicable interventions and the optimal interventions for specific clinical contexts are scarce [86]. The literature abounds with stories of failures or difficulties encountered by organizations when implementing and/or maintaining MedRec and MedRev processes [87, 88]. Mismatch between procedures and resources often leads to poor uptake by clinicians [89]. Workflow inefficiencies compromise the overall efficiency and quality of the processes; paradoxically, some studies have shown that MedRec and MedRev can cause medication errors if they are poorly implemented [90]. Although all these issues are directly related to human factors and organizational issues (HFOIs), very few studies of these issues in MedRec and MedRev have been published [91].

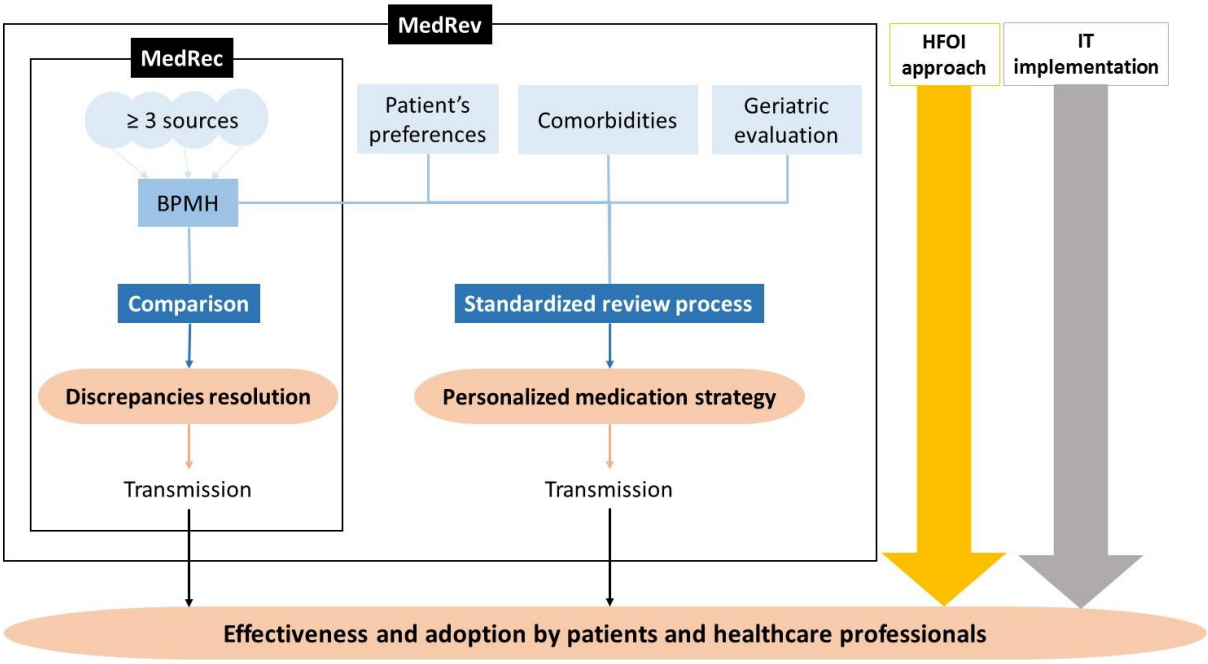
MedRec and MedRev are adaptive processes characterized by opportunistic workflows, multitasking, and high-order decision-making. Consequently, rigid workflow processes that enforce hierarchical or sequential activities will rarely meet the clinicians' needs. HFOI models and methods are ideally suited to the in-depth modelling of complex healthcare processes. They enable a thorough understanding of (i) key sociotechnical and cognitive factors at work (e.g. tasks, stakeholders, collaboration, the environment, and technologies) in context and (ii) how an organizational structure can promote effective teamwork [92]. Based on this analysis of contextual factors, a structured approach makes it possible to predict the most appropriate organizational choices for fostering staff engagement, goal alignment, team cohesion, and leadership support. Team tasks, roles, communication, and expectations are structured by (and, in turn, structure) contexts and organizations. Along with these organizational factors, many other factors (prior education, training, and experience, the influence of professional groups, regulatory policies, and cultural norms) contribute to effective team functioning in healthcare and must not be neglected [93]. Based on a holistic approach, it is important to build the strongest possible infrastructure (including training, skills, knowledge, technologies, and procedures) with regard to the given context.

7) Conclusion

MedRec and MedRev are clinical processes dedicated to drug risk management and are of relevance in geriatric medicine. The two processes are summarized in Figure 1. MedRec enables collection of the data required for the BPMH and the identification and resolution of discrepant drug prescriptions. Thus, MedRec is a prerequisite for MedRev, where the BPMH will be crosschecked against other data to produce (in collaboration with the patient) a personalized medication strategy. MedRec and MedRev have proven to be effective but their broad implementation remains difficult. Indeed, these procedures are time-consuming and require specific skills, coordination between different healthcare professionals and organizations, and dedicated resources. Although IT tools can help healthcare professionals to implement MedRec or MedRev, they cannot solve all the associated HFOIs. The involvement of healthcare professionals (particularly geriatricians and pharmacists) therefore remains

essential for the successful implementation of MedRec or MedRev in geriatric settings and thus better drug risk management for older patients.

Figure 1 – Synthesis of the MedRev and MedRev processes. MedRec provides the best possible medication history (BPMH) and identifies and resolves discrepancies in drug prescriptions. During the MedRev, BPMH is crosschecked against other data to produce a personalized medication strategy. Acknowledgment of human factors and organizational issues (HFOI) and implementation of dedicated IT tools can improve effectiveness of the two procedures.



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Conflict of interest statement

The authors declare that they have no competing interests

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