Medication review and medicines use review

A toolkit for pharmacists

2022

FIP Development Goals

15 PEOPLE-CENTRED CARE

14 MEDICINES EXPERTISE

19 PATIENT SAFETY

fip International Pharmaceutical Federation

Colophon

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Executive summary

Emerging data show that medication errors and adverse events cause significant harm to patients' health and well-being. It is estimated that the burden of adverse events due to medicines is now comparable to that of widespread diseases, such as malaria or tuberculosis.[1] The impacts of medication errors also represent a burden for health systems, with the annual cost associated with medication errors estimated at USD 42 billion worldwide.[2] While, in the United States, at least one death per day is caused by medication errors,[2] nevertheless, the harm associated with medicines use is thought to be preventable in the vast majority of cases, underscoring the urgency for coordinated efforts to effectively address this issue.

Patient safety and medication-related harm has been a topic of importance for the World Health Organization (WHO), having set up the High 5s Project in 2007.[3] Moving forward and facing the need to tackle medication errors and adverse events, in March 2017, the WHO launched its third Global Patient Safety Challenge called "Medication without harm".[1,4]

This is a global initiative to reduce medication-related harm in all countries by 50% within five years with three specific areas for commitment, namely in high-risk situations (such as those involving high-risk patients or high-risk medicines), in patients with polypharmacy, and at transitions of care.[1] The challenge's strategic framework addresses each of these three action areas with regard to four domains: patients and the public, healthcare professionals, medicines and systems, and medication practices.[4]

It is evident that, among healthcare professionals, pharmacists are essential team players in all settings to tackle medication errors. Their accessibility allows them to interact with, counsel and educate patients through a relationship of trust. Moreover, thanks to their expertise in medicines, pharmacists can detect potential and actual medication-related problems and suggest evidence-based, clinical interventions to optimise medication therapy and reduce the risk of medication errors. Pharmacists' roles as part of the healthcare team in the community, in primary health care, in hospitals and in other healthcare establishments also allow them to significantly contribute to reducing medication-related harm.

In response to the launch of "Medication without harm", FIP published a reference document on the pharmacist's role in patient safety, echoing the call for greater pharmacist involvement within healthcare teams to optimise medication therapy.[5] The FIP reference document describes and suggests pharmacist-led interventions at the patient level in addition to organisational and policy development levels, including medication review (MR) and medicines use review (MUR).[5] Two toolkits were also launched to support pharmacists in their role in patient safety, namely, a toolkit on medicines reconciliation as well as the first version of the toolkit on MUR.[6]

This current toolkit is an update to the version of the toolkit on MUR published in December 2020. This new version frames MUR as a subtype of MR, defines each type of professional service and provides guidance on their implementation. Although it could seem that the difference between both services is subtle and mostly terminological, there is a significant conceptual difference between MR — a service where the healthcare team assesses a patient's current medicines to optimise clinical, humanistic and economic factors — and MUR, where the emphasis is in the word "use", and where pharmacists interact directly with patients to improve their medicines use, considering their preferences and, ultimately, optimising adherence to treatments.

Pharmacist-led MR, including MUR, is therefore a contribution to ensuring patient safety by reducing medication harm. This toolkit serves as a practical reference guide to implementing and conducting optimal MR and MUR. It includes service implementation tools which can be directly used or adapted for clinical practice at the patient level. The organisational topics featured in this toolkit can also be used in management and policy development contexts.

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1 Background

1.1 Medication errors and patient safety

The discovery and development of medicines revolutionised health care as they cure, treat and prevent diseases that were once debilitating, if not fatal. Nevertheless, medicines also carry the potential for harm. Despite their benefits, medicines can affect individuals' health and well-being and can ultimately impact health systems if they are taken or administered incorrectly or if their use is insufficiently monitored.[2]

Several definitions of a medication error have been proposed. The United States National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient or consumer. Such events may be related to professional practice, healthcare products, procedures and systems, including prescribing, order communication, product labelling, packaging and nomenclature, compounding, dispensing, distribution, administration, education, monitoring and use."[7, 8]

The WHO stresses the fact that medication errors are largely, if not fully, preventable. As such, with an estimated annual burden associated with medication errors of USD 42 billion, it is evident that effective strategies are necessary to prevent these errors from occurring.[2] In addition, approximately 50% of all patients fail to take their medicines correctly, and it has been estimated that about 8% of total healthcare expenditure, or about USD 500 billion per year globally (as of 2011), could be avoided through optimised use of medicines.[9, 10]

Pharmacists are essential in combating medication risks and errors. Due to their unique expertise in medicines, particularly in cases of polypharmacy and medication non-adherence, and to their key role within multidisciplinary teams, pharmacists are best suited to intervene and address medication errors within multidisciplinary teams across all health care settings. Furthermore, due to the relationship of trust they develop and maintain with patients, and the frequency of their interactions, pharmacists are most adequately suited to provide education, reinforce medication adherence and dispel concerns about medicines use with their patients.

To address medication errors, structured approaches have been proposed and utilised. In addition to medication review (MR), other methods include medicines reconciliation, and participation in multidisciplinary rounds and handover/follow-up processes. As medicines are involved in all treatment plans, it is essential that pharmacists contribute to such approaches.

Among different services, MR represents an organised approach to optimising medication therapy according to updated clinical information and patient preferences. This is especially critical in patients who have gone through transitions of care, with polypharmacy, or those who have been lost to follow-up. Conducting well-designed MR will ultimately contribute to maximising medicines appropriateness, effectiveness and safety, thus improving patients' health outcomes.

1.2 FIP advocacy of pharmacist-led services to tackle medication errors

In 2020, FIP released the reference document "Pharmacists' role in 'medication without harm'" to showcase the potential for pharmacist intervention to promote medication safety at the patient, organisation and systemic levels.[5] Evidence on the benefits of pharmacist-led services on patient and medication safety in addition to case examples are presented to reinforce pharmacists' pivotal role in addressing this public health issue.[5] This reference document adds to FIP's previous advocacy efforts on pharmacists in patient safety, including the FIP statement of policy on the role of pharmacists in promoting patient safety as well as collaboration and technical expertise with the WHO, including co-authoring the WHO Patient Safety Curriculum Guide and contributing to the Jeddah Declaration on Patient Safety.[11-13]

FIP defines patient safety as “freedom from accidental or preventable injuries produced by medical care”, and the work of pharmacists is essential in ensuring such safety.[5]

In the past year, FIP launched two toolkits, namely, the toolkit on medicines reconciliation as well as the first version of the toolkit on MUR.[6] These toolkits define concepts, describe step-by-step processes, and provide practical implementation tools for direct use or adaptation to local practice settings.[6] Two webinars were also held to explore different aspects of pharmacist involvement in medication safety and to introduce the toolkits.

This current toolkit is an updated version of the toolkit on medicines use review (MUR) published in December 2020. In this version, MUR is framed as a subtype of MR, with further distinction made between each type of professional service. In fact, emphasis is made on the conceptual difference between both services, with MR representing a clinical assessment of a patient’s current medicines, and with MUR representing partnerships between pharmacists and patients to improve their medicines use through education, identification, integration of their preferences and optimisation of their medication adherence.

2 History and definitions

2.1 History of MR

While it is difficult to pinpoint the specific origins of MR, data have been published since the late 20th century regarding different forms of structured MR. For example, in the United States, a quality assurance programme named the Drug Regimen Review was instituted in 1974 and allowed for a reduction in adverse drug events, medication errors and medicine-medicine interactions (or drug-drug interactions).[14] Organised MR was also described in Scotland as early as the 1990s, whereby pharmacists would partner with general practitioners in primary care clinics to review prescriptions and treatments for several targeted conditions.[15]

MR has now grown to become more common practice in both the hospital and community settings, especially as pharmacists have begun to move forward from a dispensing role to take on more clinical, person-centred responsibilities. As pharmacists' vital role in conducting and ensuring this service becomes more widely spread, data on its implementation, benefits and challenges will continue to grow.

2.2 Definitions

2.2.1 Definition of MR

While there is overlap in the literature surrounding the definition of MR services, several proposals have been made. Furthermore, countries and territories use different variations of the term to represent similar services.

The Pharmaceutical Care Network Europe (PCNE) defines MR as a "structured evaluation of patient's medicines with the aim of optimising medicines use and improving health outcomes. This entails detecting drug related problems and recommending interventions."[16] This is also the definition retained by the WHO during its Medication Without Harm Global Patient Safety Challenge Campaign.[1] The PCNE further defines MR into subtypes as shown in Table 1.

Table 1. PCNE types of MR[17]

Type	Data sources	Information obtained through MR
1 (simple)	Medication history	Medicine-medicine (drug-drug) interactions, some side effects, unusual dosages, some adherence issues
2a (intermediate)	Medication history and patient information	Medicine-medicine (drug-drug) interactions, some side effects, unusual dosages, adherence issues, medicine-food (drug-food) interactions, effectiveness issues, side effects, issues with non-prescription (over-the-counter) medicines
2b (intermediate)	Medication history and medical (clinical) information	Medicine-medicine (drug-drug) interactions, some side effects, unusual dosages, adherence issues, medicine-food (drug-food) interactions, effectiveness issues, untreated indications, treatments with no indication.
3 (advanced)	Medication history, patient information and medical (clinical) information	Medicine-medicine (drug-drug) interactions, side effects, unusual dosages, adherence issues, medicine-food (drug-food) interactions, effectiveness issues, issues with non-prescription (over-the-counter) medicines, untreated indications, treatments with no indication

In other words, MR represents an opportunity for the healthcare team to assess a patient's current medicines in light of various clinical factors, such as their current health condition, past medical and surgical history, and actual treatment plan, while considering the patient's beliefs, preferences and concerns. Through MR, the use of non-prescription (over-the-counter) medicines and traditional, complementary and integrative medicines should also be assessed, all in all in the context of the patient's lifestyle and dietary habits. However, in reference to the PCNE definition of MR, this type of assessment is only possible in types 2b and 3 of MR, during which the patient is present and available to provide information.

2.2.2 Definition of MUR

As a subtype of MR, MUR describes pharmacists partnering with patients to improve their medicines use, consider their preferences, and ultimately optimise medication adherence.[17, 18] This service is particularly relevant for patients with polypharmacy, especially treated for chronic conditions, as well as for those with identified adherence issues. In reference to the PCNE definition of MR, type 2a comprises MUR.[17] While both services are equally important in improving health outcomes, MR aims primarily at improving clinical outcomes and thus contributes to system-level efficiency in addition to encompassing medication adherence goals, whereas MUR is a service exclusively designed to improve medication adherence.

2.3 Applications of MR and MUR

As medicines experts, pharmacists undoubtedly play a key role in MR. Pharmacists can take on a leading role by identifying patients at greater risk of medication errors, such as those with polypharmacy or taking high risk medicines, and by conducting MR for such patient groups. Following their analysis, pharmacists may discuss their findings with prescribers or, in contexts where the legislation permits, optimise pharmacotherapy by their own initiative within their own scope of practice.

Analysing patients' medication to optimise their pharmacotherapy can take place in different forms. For example, community pharmacists can meet with their patients in dedicated consulting rooms or ambulatory clinics, review their medicines, consult available clinical data, and communicate with their prescriber to suggest changes to their pharmacotherapy. They may also develop and propose strategies to improve patients' use and understanding of their medicines as well as their adherence to treatments.

Pharmacists in healthcare establishments and hospitals also conduct MR, for example, when patients are first admitted to their facility. In this role, they can take into account the patient's chief complaint, history of present illness, current investigations (laboratory tests, microbial cultures, pathology, imaging) and medication prior to admission, among other clinical information, to ensure safe and effective pharmacotherapy during their hospital stay. MUR and medicines reconciliation should also be conjointly conducted to gain an accurate description of a patient's current pharmacotherapy, including prescribed, non-prescription (over-the-counter) and traditional, complementary and integrative medicines.[19] For more information, please refer to the FIP toolkit on medicines reconciliation.[6]

3 MR and MUR practices around the world

Worldwide, MR and MUR have been developed and implemented in different settings. Governmental health authorities, pharmacy regulatory bodies and pharmacy professional organisations have contributed to the establishment of these services, having created reference and guidance documents, supported remuneration models and conducted research on different outcomes. Table 2 is a non-exhaustive summary of the services in several countries and territories.

Table 2. MR and MUR services — country examples

Country	Name of programme	Description
Australia	Domiciliary medication management review (home medicines review), residential medication management review and MedsCheck	Through home medicines review (HMR) and residential medication management review (RMMR), pharmacists meet patients, review their medication management needs, consult with additional allied healthcare professionals, and suggest their changes to medication therapy to the general practitioner.[20] The review aims to optimise medication therapy and prevent additional medication-related harm, especially in patients at risk of medication errors due to, for example, recent changes to their health or treatment plan.[20] The medication management review (MR) is initiated by the physician (general practitioner or inpatient physician) and is remunerated by the federal government.[20, 21] Furthermore, MedsCheck services (MUR) are also provided in the community setting, with a focus on patients' understanding of their medicines.[22]
Canada	MedsCheck	In the Canadian province of Ontario, MedsCheck is an interview conducted between the pharmacist and the patient as a form of MUR.[23] Certain criteria must be met for patients to be eligible for this service, including a minimum number of prescription medicines and specific time-frames, such as a recent hospital discharge, referral from a physician or nurse practitioner, or a pharmacist's clinical judgement.[23] The service is remunerated by the provincial government.[23]
England	Structured medication reviews and MUR	Structured medication reviews (MR) involve pharmacists and patients, in addition to a multidisciplinary approach, to assess the safety and effectiveness of medication therapy.[24] Previously, MUR was a remunerated service aimed at optimising medication therapy and addressing adherence issues but, since March 2021, it has been decommissioned.[25]
Japan	Brown bag programme	Led by the Hiroshima Pharmaceutical Association, the brown bag programme is a MUR service conducted by community pharmacists, where patients from the region are invited to take all medicines they are taking to the pharmacy (in the commonly used brown paper bags).[26] The pharmacist then addresses potential safety concerns, including issues regarding adherence, and educates patients about their medicines and health issues through an interview.[26]
The Netherlands	Clinical medication reviews	To address polypharmacy in the elderly, pharmacists across different care settings can conduct MR to increase the effectiveness of medication therapy in this high-risk population as well as contribute to de-prescribing. This is usually performed based on the STRIP method (Systematic Tool to Reduce Inappropriate Prescribing).[27]

Country	Name of programme	Description
New Zealand	MUR and Medicines Therapy Assessment (MTA)	MUR services can be provided by accredited pharmacists to increase patients' knowledge about their medicines and improve their adherence.[28] MTA (MR) can also be provided by accredited pharmacists as a form of clinical assessment to identify, resolve and prevent medicine-related problems as well as optimise the effectiveness of medication therapy.[28]
Scotland	Medicines, Care and Review Service	Community pharmacists partner with patients to review medicines use and address any concerns regarding medication therapy (MUR).[29] A care plan is developed to address such issues and determine methods to improve medicines use.[29]
Slovenia	MUR	Pharmacists in Slovenia undertake MUR according to a standard operating procedure among targeted patients in the community pharmacy setting.[30] MR services are also performed in healthcare centres by clinical pharmacists using different sources, such as patient interviews, medication histories and clinical data.[31] The conclusions of the service are thereafter transferred to the patient's general practitioner.[31]
Spain	REVISA project and conSIGUE programme	Drawing on experience and guidance from the United Kingdom, Spanish community pharmacies implemented an MUR service.[32] Pharmacists met with patients to review their medicines and ensure their understanding of their medication therapy.[32] The REVISA project was undertaken to assess the establishment of the service.[32] In addition, MR services within community pharmacies among older patients with polypharmacy were also evaluated through the conSIGUE programme.[33]
Switzerland	Polymedication check	The Swiss Polymedication Check (MUR) was conducted through a structured patient interview along with medication history, aimed at patients taking at least four medicines for at least three months.[34, 35] This service aimed to address issues of medication adherence and improve patients' understanding of their medicines, but has been decommissioned since July 2020.[34, 35]
United States	Medication therapy management	Medication therapy management encompasses a variety of healthcare services provided by pharmacists, including medication therapy reviews (MR).[36, 37]

4 Clinical, economic and humanistic impact

4.1 Impact of MR

4.1.1 Clinical outcomes

MR is a structured approach to optimising medication therapy, and there are quality data available supporting the clinical impacts of this service. One systematic review that included 10 studies from different countries and territories demonstrated that, through MR, pharmacists were capable of detecting a significant amount of medication-related issues in elderly patients.[38] Another study showed that, through MR, Dutch community pharmacists identified a median of two medication-related problems per each elderly patient with polypharmacy.[39]

Some data have shown that the provision of MR by community pharmacists reduced the number of patients visiting emergency departments.[33, 40] Additional data have also shown that MR is associated with improved prescribing outcomes, such as decreasing polypharmacy, selecting and prescribing the most appropriate medicines and formulations, and reducing preventable adverse drug events.[1, 15]

Other benefits of community pharmacist-led MR on a variety of outcomes have also been demonstrated, including improved disease control and improvement in process measures, such as medication adherence and medicines management.[41, 42]

It is nevertheless important to note that robust evidence is lacking concerning the effectiveness of MR on broader outcomes, such as mortality or hospital readmissions, as an isolated service.[43-45] The literature suggests that MR should be conducted along with other services, such as medicines reconciliation, patient education and follow-up at transitions of care, to yield optimal outcomes.[46, 47] In fact, a randomised, controlled trial echoed this recommendation by demonstrating that patients who received comprehensive pharmacist-led MR as part of a clinical intervention bundle experienced close to 20% fewer hospital admissions and approximately 50% fewer emergency room visits compared with those receiving usual care.[1, 47] There was also an 80% reduction in medication-related readmissions.[1, 47]

The current data are encouraging and support the continued effectiveness of pharmacist-led MR in terms of clinical outcomes. More robust, tangible data on more specific clinical outcomes would allow further reinforcement of pharmacist-led MR as an essential service in ensuring medication safety.

4.1.2 Economic outcomes

While there are data showcasing the clinical impacts of pharmacist-led MR, data on the benefits for health systems and for society are more scarce. On one hand, some data have estimated that through a clinical intervention bundle including comprehensive MR, there was a reduction of USD 230 of total hospital-based healthcare cost per patient.[1, 47] Economic benefits were also seen when MR was conducted in residential long-term care facilities and on discharge from a health care facility.[48-50]

On the other hand, some data have shown that pharmacist-led MR was associated with no change in the number of hospitalisations nor was it proven to be cost-effective when compared with usual care.[15, 51]

The economic impact of MR may be difficult to assess due to longer follow-up times required to truly assess the sustainability and cost-effectiveness of changes implemented through MR. Facing these conflicting results, additional research efforts are needed to appropriately assess the benefits for healthcare costs and health systems that may be obtained with pharmacist-led MR in addition to the clinical benefits.

4.1.3 Humanistic outcomes

Several studies have sought to assess the humanistic outcomes of MR. In the Netherlands, clinical MR was found to improve self-reported quality of life in the elderly according to the EQ-Visual Analog Scale, although not captured through the EQ-5D-5L scoring system.[52] A systematic review focusing on process, impacts and outcomes of MR or of medication reconciliation in Australian residential care facilities found only one primary

study assessing quality of life, using the Quality of Life in Alzheimer's Disease Scale, but the study was not sufficiently powered to identify any impacts. However, the authors also report on two primary studies included that successfully showed MR decreased the anticholinergic burden, associated with adverse effects from medication.[53] One systematic review, including 20 studies conducted in community-dwelling individuals where the most frequently used measure was the generic SF-36, identified only four studies with significant benefits in quality of life; however, only one of these was possible to include in the meta-analysis of which the final result did not favour MR.[51, 54] Another systematic review included 13 RCTs, among which only one assessed quality of life, thus impeding this outcome to be meta-analysed.[54] These findings suggest more robust data is needed to demonstrate the positive effects of MR on humanistic outcomes.

While current data on the humanistic outcomes of MR may not appear sufficient, it is important to note that current health-related quality of life measurement indicators do not assess specifically the impact of pharmaceutical care interventions, but also encompass a variety of different factors and domains.[55] It has therefore been argued that these measurement tools may not be sensitive enough to assess the humanistic impact of pharmacy services, including MR.[55] This underscores the need for the development of health-related quality of life measurement indicators that particularly pertain to pharmaceutical care interventions.[55]

4.2 Impact of MUR

MUR services aim to improve medication adherence through engagement with patients. As such, outcome measurements surrounding MUR primarily pertain to medication adherence rather than clinical or economic measurements. The magnitude of improvement on medication adherence observed in several studies assessing MUR varied according to the baseline level of adherence, though overall effectiveness of the service has been difficult to demonstrate, potentially due to variability in the delivery of the service.[30, 34, 56] Among such studies, it may be noteworthy to consider that variations in the methods used to measure medication adherence, including assessing samples of patients from different phases of medication adherence as described by the ABC taxonomy — in which adherence to medications is conceptualised, based on behavioural and pharmacological science, and which supports quantifiable parameters — , may have contributed to the limited evidence of the benefits of MUR.[57] Nevertheless, the service overall appeared to increase patients' understanding of their medication therapy, and it appeared to be appreciated by patients.[32, 35]

In the long run, engaging patients in their medication therapy and addressing adherence issues may lead to improved patient outcomes through adequate medicines use and may lead to decreased medicines waste.[56] Patients may also be less likely to have their medication doses wrongly increased, therefore increasing the risk of certain adverse effects, if their current medication regimen does not yield the expected clinical outcomes due to lack of adherence rather than a lack of effectiveness. Moreover, MUR services may represent a method for patients to further engage in self-care, therefore limiting the burden placed on referral and emergency services.[56]

Time, efforts and resources must be put into place to effectively implement MUR, and therefore high-quality trials are necessary to adequately evaluate the cost-effectiveness of this service.

5 Implementing effective services

5.1 Conditions and requirements for MR

Conducting effective MR requires the necessary operational and human resources and thus presents several challenges.[56] Certain conditions must be met to ensure its optimal implementation. Furthermore, care should be taken to develop prioritisation or screening tools to optimise the use of MR and individualise the service to those who would most benefit from it.[21, 58]

5.1.1 Data and access to information

MR is a structured assessment of a patient's medication therapy. Access to the necessary information to adequately analyse medication therapy, identify actual and potential medication-related problems, and suggest the necessary interventions is critical. Broadly speaking, three information sources should be consulted: medication history, clinical data and patient information (interview).

It is essential for the pharmacist to have access to the patient's medication profile. Information on active and previous medication is essential and should include, but is not limited to, the following elements:

1. Medicine names
2. Formulations
3. Doses
4. Regimens
5. Route(s) of administration
6. Duration of treatment (with start and end dates)
7. Name and specialisation of prescriber

This information should ideally be centralised and available for consultation, on paper or digitally, for adequate analysis of the patient's records. Ideally, the information should be obtained directly from or verified with the patient together with any prescriptions or other documents linked to the patient's clinical and medication history.

Beyond information on the patient's medication, clinical data should be consulted to ensure a proper understanding of the patient's current health status. Clinical data include information on current investigations (laboratory results, microbial cultures and antimicrobial sensitivity tests, and imaging and pathology reports), past medical and surgical history, family history, current health conditions and recent hospital admissions. This information can be primarily accessed through electronic interfaces or paper files when electronic systems are not available.

Finally, patient interview is also an integral part of collecting data for MR.[59] Through patient interviews, pharmacists can obtain information that is not routinely documented, which includes side effects, medication adherence, medication preferences, lifestyle habits, and the use of non-prescription (over-the-counter), traditional, complementary and integrative medicines.

5.1.2 Resources and logistics

To conduct a MR, adequate time, resources, logistics and professional training are necessary. Among pharmacists' other responsibilities, such as dispensing and counselling, specific time should be scheduled by employers to ensure proper execution of an MR. Moreover, the necessary tools to conduct MR, such as access to electronic equipment, software or documentation, are required to gather and document all MR interventions. A dedicated physical area to conduct patient interviews to complete MR is also necessary. Finally, pharmacists should receive the necessary training to optimally conduct this service.

Clinical tools, interaction detection software, databases, clinical decision support systems and guidance documents — such as the Medication Appropriateness Index, Beers criteria, and STOPP/START criteria as well as deprescribing algorithms and local, regional, national or international guidelines — may be useful resources to guide pharmacists in carrying out MR.[60-63]

An appropriate remuneration scheme is important to ensure the sustainability of pharmacist-led services, including MR. This remuneration would not only compensate for the time, effort and tools required to conduct proper MR, but also to recognise the pharmacist's expertise and experience and the savings generated by this service. Awareness will be required among stakeholders to ensure appropriate compensation for the service, preferably from public and/or private third-party payers.

5.1.3 Collaborative efforts

Interprofessional collaboration is essential to ensure beneficial outcomes of MR. While a pharmacist may analyse a patient's file and make interventions deemed necessary, if these interventions are not well received and are not acted upon by other healthcare professionals, then the outcomes are bound to be limited. Furthermore, as medicines experts and key members of the healthcare team, pharmacists are responsible and accountable for making recommendations and interventions to optimise their patients' medication therapy.

For example, in the community setting, collaborative approaches with general practitioners and other members of ambulatory clinics are necessary for solving pharmacotherapeutic problems and optimising medication therapy between prescribers and pharmacists. Ensuring excellent communication channels, clear and concise documentation, and shared access to information are important features to ensure proper collaboration. In the example of healthcare facilities and hospitals, collaboration between prescribers, nursing staff and other healthcare practitioners is also essential to ensure recommendations made regarding medication therapy are carried out.[64] Transitional care is also necessary to ensure MR efforts are maintained throughout transitions of care, such as following hospital discharge or transfers to residential care.[64, 65]

In addition to counting on collaborative efforts with other healthcare providers, a relationship of trust with the patient is equally important. Being open-minded and attentive to patients' concerns regarding their medication therapy is essential when analysing medication profiles, and patients' preferences can directly affect which interventions pharmacists make. Promoting patient-centred care by taking the time to adequately interview the patient and by explaining the rationale behind recommendations and choices is necessary.

5.2 Considerations for MUR

In the context of MUR, information should primarily be obtained from two sources: medication history and patient interview. Obtaining such information is crucial to primarily assess medication adherence, but also issues with medication effectiveness, safety and tolerance. These data are critical in upholding pharmacists' responsibility to take action in improving their patients' medicines use.

Similarly to MR, MUR requires the necessary time, resources, logistics and training to be effectively implemented. Dedicated scheduled time, equipment, physical spaces and remuneration schemes are all important.

5.3 Challenges for low-resource settings

As already described, there are several conditions regarding the necessary data, logistics, systems and relationships that should be met to ensure MR is optimal. It is important to note that these conditions can still be met in all instances, including smaller-scale pharmacies or developing regions, for optimal MR and MUR.

Access to medication history, investigative data, clinical information and documentation can be achieved without elaborate software, and paper charts can still be organised and utilised. Engaging with the patient to collect information as well as to reinforce medication adherence and education can be performed in-person and requires few material or technological resources.

Systemic change can also take place in all settings to advocate pharmacist-led services, such as MR and MUR, and ensure their appropriate recognition and compensation. Adopting a collaborative practice with prescribers and patients is also feasible in all settings. It is important to consider that MR is ultimately conducted with the mindset to optimise all aspects of medication therapy, which in turn will improve health outcomes.

6 The MR and MUR process

6.1 Step-by-step process and minimum information set

Table 3 compares and contrasts the step-by-step processes for MR and MUR. On one hand, a process for MR has been used which may be directly used or adapted to local practices. It is based on different proposed approaches for conducting MR.[1, 58] On the other hand, considering how MUR is a subtype of MR, the two main sources of data involve medication history and patient information. Nevertheless, with MUR, the focus is shifted to improving medication adherence and the patient's understanding of their medication therapy. A proposed process, adapted from the PCNE workshop on MR, is described in the table.[66] A relationship of trust should have initially been established with the patient prior to providing either of these services.

Table 3. Processes for MR and MUR

Step	MR	MUR
Collecting all necessary data with the patient's consent	Data may include laboratory results, microbial cultures and antimicrobial sensitivity tests, imaging and pathology reports, information on past medical and surgical history, and recent hospitalisations, if available. It is important to conduct a medicines reconciliation before the MR to obtain an accurate, comprehensive understanding of the patient's current medication therapy, especially if the patient was recently discharged from a hospital or underwent a transition of care.	Data include the most up-to-date list of medicines the patient is currently taking and can be obtained from the pharmacy database or patient files. When going through the medicines list, the pharmacist can identify those that may warrant further clarification on behalf of the patient.
Reviewing medication using the medication history and in collaboration with the patient	1. Is the patient able to follow the medication regimen? 2. Does the patient perceive that there is a need for his medication? 3. Has the patient experienced (or is the patient experiencing) any adverse drug effects? 4. Does the patient feel relief/improvement when taking the medicine? 5. Are there any barriers to medication adherence mentioned? 6. In cases where the patient has been taking it before, have they been adherent? 7. Does the medication interfere with the patient's lifestyle? 8. Is each medicine still indicated?	1. Is the patient able to follow the medication regimen? 2. Does the patient perceive there is a need for the medication? 3. Has the patient experienced (or is the patient experiencing) any adverse drug effects? 4. Does the patient feel relief/improvement when taking the medicine?

Step	MR	MUR
	9. Is each diagnosed disease being treated by a medicine, noting that some diseases may not require medication therapy and that some diseases may require treatment with more than one medicine? 10. Is the medication at the lowest effective dose? If the patient has renal or hepatic impairment, do any medicines or dosages require adjustment? 11. For each medicine, are there any adverse effects? 12. Could there be any medicine-medicine (drug-drug), medicine-disease (drug-disease), or medicine-traditional or complementary medicine, or medicine-food (drug-food) interactions? 13. Can the dosing regimen or route of administration be simplified? 14. Are there any more cost-effective alternatives to this medicine? 15. Have new guidelines reinforced or discouraged the medicine's use (place in therapy)? 16. Can each medicine be properly stored and disposed of? 17. Are there any non-pharmacological methods that may be used? 18. Do any non-prescription (over-the-counter) medicines, natural health products or complementary or traditional medicines require intervention?	
With the patient, reviewing patient's level of health literacy and capacity for self-monitoring	1. Does the patient understand their medicines and their indications? 2. Is the patient capable of self-monitoring, if required (blood glucose, blood pressure, etc.)? 3. Is the patient aware of red flag symptoms that would require an urgent medical consultation?	
With the patient, reassessing medicines management and medication adherence	1. Is a written medication plan available for the patient, and is it up to date? 2. Are medicine formulations and dosing schedules convenient for the patient? Does the patient have any issues taking or administering their medicines? 3. Can medication management be improved, for example, through the use of dosage aids (such as pillboxes)? 4. Is the patient adherent to their dosing schedules? 5. Does the patient believe in the benefits of medicines? Is there any concern from the patient about medication harm? 6. Does the medication interfere with the patient's lifestyle or beliefs?	

Step	MR	MUR
Identifying medication-related problems and issues of care as well as determining interventions	1. Does the patient agree with the proposed changes and appear engaged to having them implemented? 2. Does the patient agree to follow-up communications to monitor the safety and effectiveness of the medication changes and to monitor medication adherence to these changes? 3. Should any interventions be prioritised over others? 4. Does the prescriber agree with the proposed changes and will they act upon them? 5. Does the prescriber agree to follow-up communications to monitor the safety and effectiveness of the medication changes?	1. Does the patient agree with the proposed changes and appear engaged to having them implemented? 2. Should any interventions be prioritised over others? 3. Does the patient agree to follow-up communications to monitor the safety and effectiveness of the medication changes and to monitor medication adherence to these changes?
Communicating with prescribers and other healthcare professionals, and documenting suggested changes	Multidisciplinary collaboration is necessary for the interventions to be appropriately implemented. As such, the suggested interventions should be promptly communicated to prescribers and other healthcare professionals through a collaborative approach. Literature or references may also be sent to involved parties to support the suggestions. Once the changes have been discussed, the patient should be informed regarding the results and outcomes. Finally, it is important to ensure the entire process has been adequately documented.	With the patient's consent, the suggested interventions may be communicated to prescribers and other healthcare professionals through a collaborative approach for informative or documentation purposes. Literature or references may also be sent to involved parties to support the suggestions. Finally, it is important to ensure the entire process has been adequately documented.

Figure 1 provides a summary of the MR and MR process. Figure 2 illustrates the minimum information that needs to be reviewed for each medicine, particularly for MR.

Figure 1. Step-by-step process of MR and MUR

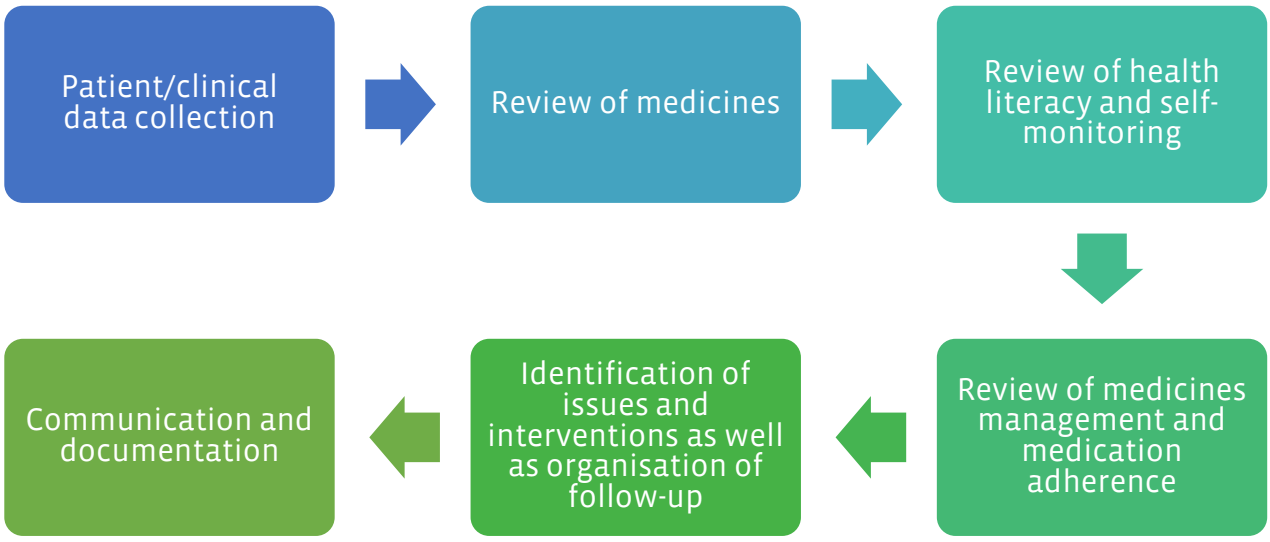
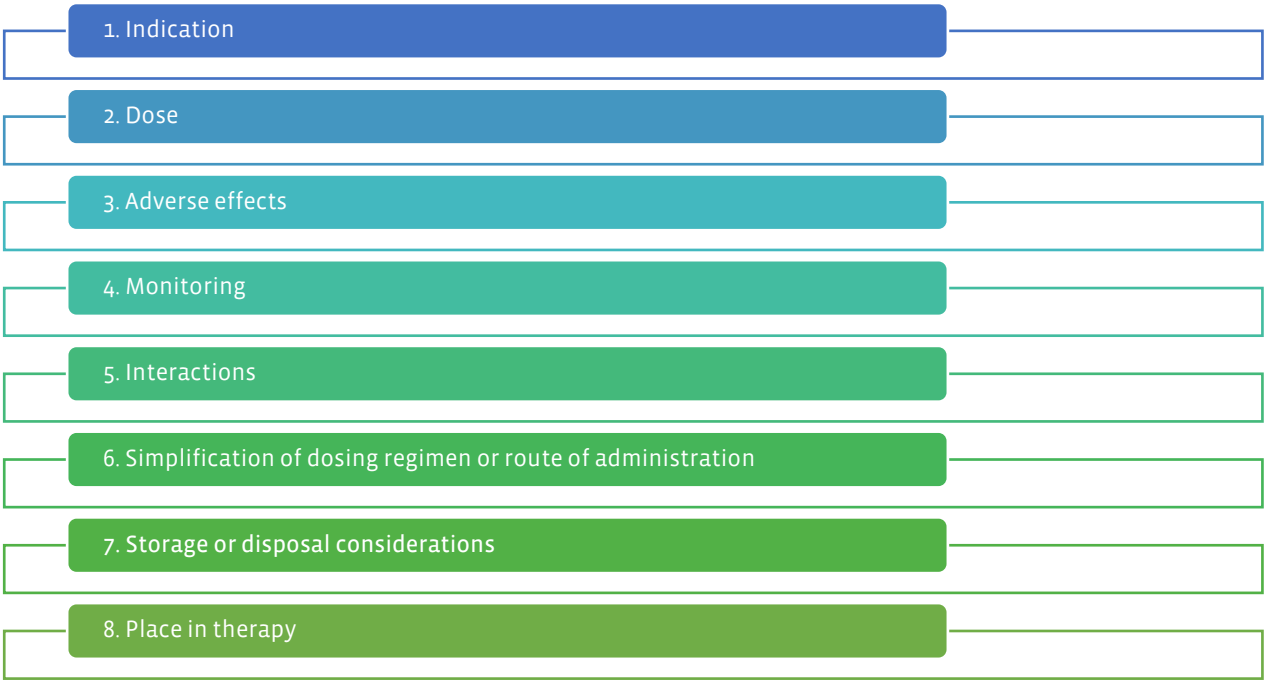


Figure 2. Information to review for each medicine



6.2 MR implementation tools

The following forms developed by FIP can be used to assist in the implementation of MR. For additional information, guidance and tools, further literature and documents developed by professional organisations or health authorities are readily available.[20, 23, 36, 67]

6.2.1 MR template form

PERSONAL INFORMATION	
Date of interview	
Patient's name	
Date of birth	
Gender	
Height and weight	
Health insurance information	
Patient's telephone number	
Name of pharmacy	
Pharmacy's contact details	
Name of primary care physician, specialist physicians, and other relevant healthcare professionals	
Contact details of primary care physician, specialist physicians, and other relevant healthcare professionals	
Recent hospitalisations	
Allergies	
Intolerances	
Medication management *(by patient or by care-giver)*	
Organisation of medication *(Pre-packaged or dosage aids such as pillboxes prepared by patient or by pharmacy)*	
Perceived level of health literacy	
Perceived adherence to prescribed medication	
Lifestyle habits *(smoking, recreational drugs, alcohol, nutrition, autonomy for activities of daily living)*	
Recent medication changes *(within previous months or year)*	

CLINICAL DATA AND INVESTIGATIONS	
Past medical history and current medical conditions	
Past surgical history	

Family health history	
Relevant laboratory results and point-of-care or ambulatory testing results	
Relevant microbial cultures and antimicrobial sensitivity tests	
Relevant imaging results	
Renal function (data, such as creatinine, creatinine clearance, estimated glomerular filtration rate)	
Hepatic function (data, such as liver function tests or Child-Pugh score)	

MEDICATION REVIEW AND ASSESSMENT

Medicine *(non-proprietary name)*	**Brand name**	**Formulation**	**Dose**	**Frequency**	**Route of administration**	**Indication**	**Comments** *(adverse effects, action to take, interactions, required monitoring, adherence, etc.)*

7 Conclusions

This toolkit aims to provide a framework for implementing MR, including MUR, as a structured process to optimise medication therapy outcomes and adherence. Implementation tools are ready to be directly used or adapted to local practices. This toolkit is also intended to support national and local development of optimal pharmacist-led MR, including MUR.

Based on the research work and available evidence in practice, services and guidelines, MR is a valuable service to promote patient safety by addressing medication errors and reducing medication-related harm, in addition to improving medicines effectiveness and safety, medication adherence and patients' understanding of their treatment regimen, thus ultimately improving health outcomes.

Emerging data have demonstrated the multiple benefits of MR and MUR, and pharmacists are called upon to take on leading roles in implementing, conducting and advocating for these services. The necessary resources, frameworks, and conditions, including appropriate remuneration models by third-party payers, should also be in place in the community and hospital pharmacy settings to provide the optimal conditions to set up effective MR and MUR services and further contribute to the knowledge on their clinical benefits and cost-effectiveness of the services.

MR provides an evidence-led component in improving health outcomes, and both MR and MUR represent essential components in reducing medication errors and ensuring patient safety.

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