

An Overview of Pharmaceutical Reconciliation

Running Title: *Pharmaceutical Reconciliation*

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ARTICLE INFO

Received: 12/02/2023

Accepted: 12/30/2023

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Abstract

During the move between healthcare settings and changes in the medical status of patients, it is very important to update the correct drug regimen according to the clinical conditions to avoid the possibility of medical errors. Nearly half of medication errors occur during initial admission, transfer between hospital departments, and before discharge. Among these errors, about 30% of cases have the potential of seriously harming the patient. Some risk factors, such as old age and the number of drugs used, are associated with an increased risk of medication discrepancies. The medication reconciliation process can significantly reduce the risk of potential errors. It includes obtaining, verifying, and documenting a list of the patient's current medications and comparing it to the patient's medication orders and condition to identify and resolve any discrepancies. Comparing what is being prescribed in one setting with what is being taken in another will prevent errors of drug-drug interactions, omission, and other discrepancies. Pharmaceutical reconciliation is an important element of patient safety and rational drug use, and it can significantly contribute to the health economy.

Keywords: Discharge Medication, Hospitals, Medication Errors, Pharmaceutical Reconciliation

Citation: Poorheidari Gh, Mashhadi Akbar Boojar M. An Overview of Pharmaceutical Reconciliation. *Adv Pharmacol Ther J.* 2023;3(3): 142-149.

Introduction

Some studies show that a high percentage of patients admitted to the hospital, experience at least one case of unwanted drug inconsistency during the admission stage, and in some of them, these cases can be potentially problematic and lead to a disruption in the patient's treatment process or other significant injuries (1, 2). It has been shown that a group of patients who are discharged from the ward experience unwanted side effects, most of which are related to the patient's medication regimen, which can often be prevented and controlled (3).

Medication or pharmaceutical reconciliation (PR) is a formal process in which a complete and accurate list of the patient's medications is prepared before admission to the hospital and compared with the physician's prescriptions during admission, transfer between departments, or discharge (4). In this process, the list of medicines of hospitalized patients is updated as much as possible, and probable discrepancies are corrected (5, 6). In older age patients and polypharmacy conditions, the most frequent medication discrepancies were reported (5, 7).

It seems that PR was first described in 2003. According to the World Health Organization (WHO), PR is a formal process of interaction between healthcare professionals and the patient to ensure the correct and complete transfer of drug information during the change in medical care (8). Institute for Healthcare Improvement (IHI) also states that PR is the process of preparing the correct possible list of all the drugs used by the patient and comparing it with the list of drugs prescribed for the patient during admission,

interdepartmental transfer or discharge, with the aim that at all transfer levels of the patient in the hospital, the correct drugs are used by the patient (9, 10). Hence, rational and perfect hospital-based PR practices are a major patient safety element.

The frequency and severity of medication errors were considered in several studies and it has been clearly stated that unintended medication discrepancies, especially in internal and emergency medicine save lives (9). The economic impact of PR and cost savings achieved through the reduction of medication errors and adverse drug events can remove a significant economic burden from the health system (6).

Objectives of Pharmaceutical Reconciliation

It is very important to prepare and maintain accurate current information (the best possible drug history) of the drugs used (11). A best possible medication history' is described as the PR's cornerstone. This information must be recorded accurately and unambiguously. Stopping or continuing to take the medicine incorrectly should also be avoided (12).

Correcting inconsistencies between prescribing instructions and what the patient consumes is an important point. Not being familiar with the available pharmaceutical forms and the correct way to use them can lead to the incorrect use of the drug by the patient, contrary to the initial idea (13).

Prevention of unwanted events and potential injuries to the patient, as well as prevention of medication errors when transferring the patient from the community to the hospital, should be on the agenda (14). Some actions may be missed or

mistakenly replaced by another drug. The presence of drugs with similar spelling or pronunciation (look-alike, sound-alike medications) can increase the probability of this happening (15, 16).

Correcting drug inconsistencies and reducing the final costs of patients' drug treatment are also on the agenda of PR (17). An expensive drug does not necessarily mean more effective or even fewer side effects (18). In addition, according to the opinion of some pharmacists, many drug shortages are not real and can be compensated with alternative drugs (19).

Optimum and rational drug use and improving drug safety during hospitalization and after the patient's discharge are other goals of PR. Unfortunately, although most prescribers (physicians) often have sufficient knowledge of their specialized drugs, when these drugs are taken together by the patient, there is a possibility of multiple interactions depending on the patient's conditions and dosage (20, 21). On the other hand, some of these interactions especially in elderly patients affect the course of the disease and are even life-threatening, which requires special attention (21).

The final goal of PR is to educate patients about the correct way to take drugs increase patients' adherence to continuing drug treatment and reduce drug side effects and readmission rates (22, 23). Unfortunately, a patient who receives medicine for the first time, if he does not receive proper training, can sometimes continue to use the wrong medicine until the end of his life and therefore, the cooperation of pharmacists and nurses plays a key role in this case (24).

Procedures for Pharmaceutical Reconciliation

The steps that can be taken to obtain a comprehensive drug formulation are listed in **Figure 1**. At the end of each stage, the confirmed information is transferred to the patient or the next care provider (25). The physician's decision about the drug reconciliation (For example drug omission, etc.) is one of the most important parts of PR. After the PR has been done by the pharmacist, the related form should be seen by the physician and write his decision about the medication discrepancies.

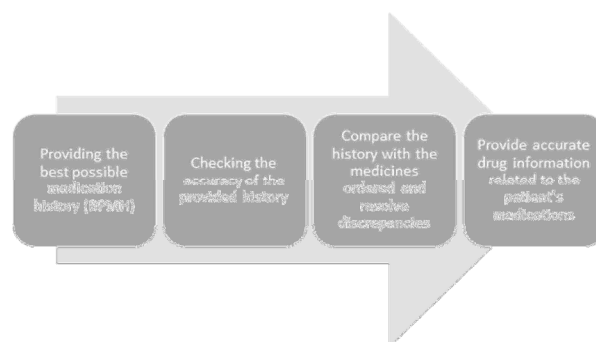


Figure 1. Separate stages of correct pharmaceutical reconciliation

Obtaining the best possible medication history (BPMH)

To create the best possible medication history, different patient information sources should be considered. Also, to check the accuracy of the obtained medical history, the medical history should be compared with more than one of the following sources and checked for its accuracy:

1. Talk to the patient's previous physician/ pharmacist/ nurse
2. Examining the patient's blister or medicine package
3. List of home medicines of the patient
4. Examining the patient's insurance booklet
5. Previous patient record (26).

Checking the accuracy of the history obtained through comparison with the secondary source

It is essential to check the documentation of the patient or other related persons and match them with each other to ensure that the patient is taking the drug or drugs listed in the file, and it will also prevent secondary mistakes (27).

Combining the best possible drug history with the patient's current medications

After comparing the prescription drugs with the patient's drug history, the cases of non-compliance should be identified and the physician should be notified as soon as possible (28).

Provide accurate drug information related to the patient's medications

Determining the reasons for replacing or discontinuing drugs should be clearly stated for the physician, patient, and treatment staff. The availability of this information will greatly help in reading the file, monitoring the treatment process, and finally Interpretation of response to pharmacotherapy (27).

The list of drugs available in the PR form and other important points

In a suitable medication history and consequently, PR form, the following should be carefully considered:

1. Prescription drugs
2. Non-prescription drugs (the prescriber does not recommend taking them and the patient takes them on his own).

3. Over-the-counter (OTC) drugs such as antitussives, painkillers, antacids, etc.

4. Supplements, herbal medicines, and specialized products of traditional medicine.

5. Medicines that a person takes occasionally and not always.

6. Medicines with non-systemic forms (topical, inhaled, etc (29).

In addition, the name of the drug (preferably the generic name), dose, intervals, route, and duration of administration should also be mentioned precisely in the PR registration (30). The PR should be recorded in such a way that the physician and other prescribers have easy access to it at the time of each prescription. This history should be more complete and different from the "patient's home medications list" (31).

It should be ensured that the drug reconciliation form at each stage of patient treatment (even when transferring from one department to another) mirrors the full view of the drugs that the patient is currently taking. The consolidation form must always be updated (32).

The most common considerable discrepancies in the pharmaceutical reconciliation process

The most probable discrepancies that can be identified and resolved in the PR process are shown in **Figure 2**. Incorrect doses or timing, Improper prescription period, and choosing the unsuitable pharmaceutical dosage form are other errors that the PR process can prevent from occurring (27).

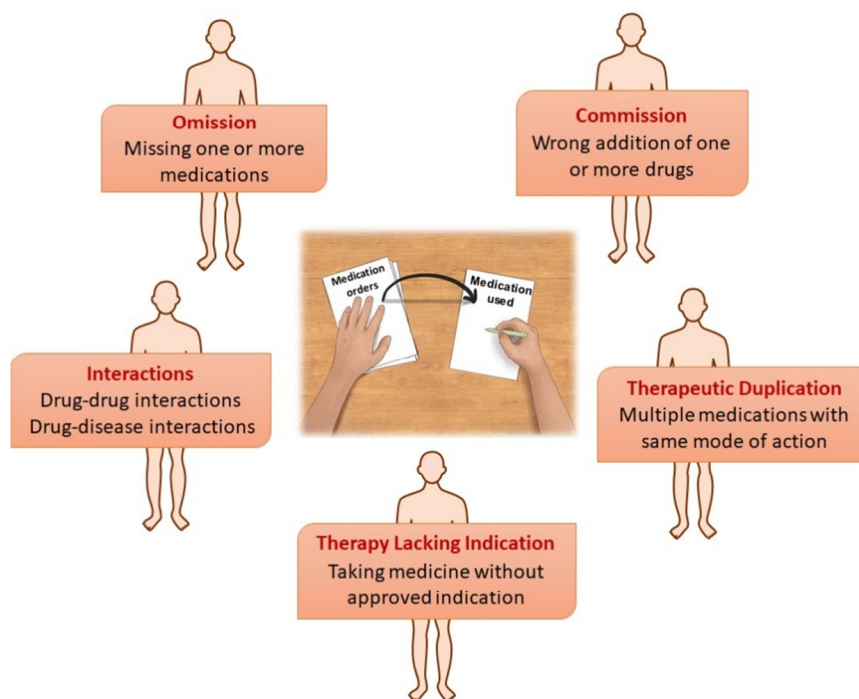


Figure 2. The most common drug discrepancies in the pharmaceutical reconciliation process

1. Omission

The Patient is taking medicine for the disease, but it is not written in the list of his/her medicines (33). A retrospective study showed that combined drug intervention resolved almost all drug therapy inconsistencies and omissions. Consequently, a pharmacist-directed medication care service will have a significant impact on medication-related clinical outcomes and care processes (34).

It is important to avoid omissions; as certain medications may be added to or discontinued from the patient's medication regimen or dosages may be changed during hospitalization. It has been documented that after hospitalization, up to 40% of medications used during hospitalization are not continued at discharge, and up to 45% of drugs prescribed at discharge are medications prescribed during hospitalization for the first time (35).

2. Commission

If the patient does not take the drug and it is wrongly included in his/her medicine list, an error of commission has occurred (27). Some studies have reported about 50% commission error among various potentially harmful medication discrepancies (36).

3. Therapy Lacking Indication

The correct prescription indication is the first step in the rational prescription and use of drugs, and choosing the wrong drug leads to errors in other pharmacotherapy parameters (37). Unfortunately, there have been many reports of the non-indication use of various drug categories, especially antibiotics (prophylaxis and empirical uses), and the process of PR can prevent this event to a large extent (38, 39).

4. Therapeutic Duplication

Therapeutic duplication occurs when two or more drugs with the same indication or mechanism of action are prescribed to the same patient without

acceptable pharmacokinetic or pharmacodynamics differentiation from each other (40). Inaccurate medication ingestion histories put patients at risk of therapy duplication and effective PR is needed to obtain an accurate list (41). Similar antibiotics, opioid analgesics, and anti-nausea drugs with the same mechanism are among the most common drug categories that have been reported in duplication in hospitalized patients (40).

5. Interactions

The new clinical conditions of the patient and the combination of several previous and newly prescribed drugs provide the possibility of many potential interactions. Drug-drug interactions and drug-disease interactions can cause failure to respond to therapy, reduction of therapeutic effects, the late occurrence of therapeutic response, and even incidence of toxic and fatal effects (42).

Various studies have shown that more than two-thirds of hospitalized patients experience at least one drug interaction, and about 10% of them are serious interactions (43). The use of high-performance drug interaction evaluation resources such as Lexi-Interact and Micromedex and expert pharmacist interventions can minimize the complications caused by drug interactions (44). Some studies reported that opioid analgesics, central nervous system depressants, and antibacterial agents are also among the most commonly prescribed medications in hospitalized patients with a high potential for drug interactions (42).

The Economic Impact of Medication Reconciliation

Reducing the duration of hospitalization, preventing adverse drug events, and not taking unnecessary drugs can directly reduce the cost

imposed on the healthcare system to a significant extent (45). Some randomized controlled trial studies have shown that medication reconciliation reduces clinically important medication errors by up to 26% (46). Another investigation estimated the benefit-cost ratio of PR to be 2.31:1, suggesting its advantages greatly outweigh its costs (47).

Conclusion

The pharmaceutical reconciliation process, using a formal and structured approach involving patients and treatment staff, especially pharmacists, which is carried out in an environment with shared responsibility, can reduce the complications and mortality of medication errors that occur in the alteration of healthcare settings and the medical status of patients. Comparing what is being prescribed in one setting with what is being taken in another will prevent errors of drug-drug interactions, omission, and other discrepancies. This process is a cost-effective use of healthcare financial resources and has been considered an important element of patient safety and healthcare quality.

Conflict of interest: No.

Funding: No.

Acknowledgments: No.

Ethical considerations: No biased point of view based on the conflict of interest and personal bias of the authors has been considered in reviewing the sources and organizing the contents of this article.

Authors' contribution: Conceptualization:

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Mahdi Mashhadi Akbar Boojar Writing – review &
editing: Mahdi Mashhadi Akbar Boojar

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