Medication Errors: Scope And Prevention Strategies

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Abstract- *A medication error is a failure in the treatment process that leads to, or has the potential to lead to, harm to the patient. Medication errors can occur in deciding which medicine and dosage regimen to use (prescribing faults— irrational, inappropriate, and ineffective prescribing, under prescribing, overprescribing); writing the prescription (prescription errors); manufacturing the formulation (wrong strength, contaminants or adulterants, wrong or misleading packaging); dispensing the formulation (wrong drug, wrong formulation, wrong label);administering or taking the medicine (wrong dose, wrong route, wrong frequency, wrong duration); monitoring therapy (failing to alter therapy when required, erroneous alteration). They can be classified, using a psychological classification of errors, as knowledge-, rule-, action- and memory-based errors. Although medication errors can occasionally be serious, they are not commonly so and are often trivial. However, it is important to detect them, since system failures that result in minor errors can later lead to serious errors. Reporting of errors should be encouraged by creating a blame-free, non-punitive environment. Errors in prescribing include irrational, inappropriate, and ineffective prescribing, under prescribing and overprescribing (collectively called prescribing faults) and errors in writing the prescription (including illegibility). Avoiding medication errors is important in balanced prescribing, which is the use of a medicine that is appropriate to the patient's condition and, within the limits created by the uncertainty that attends therapeutic decisions, in a dosage regimen that optimizes the balance of benefit to harm. In balanced prescribing the mechanism of action of the drug should be married to the pathophysiology of the disease. This review article brief about medication error, what they are, how they happen, and how to avoid them.*

Keywords- Medication errors, Adverse drug event, Prescription

I. INTRODUCTION

Medications are offered by health services throughout the world. However, with substantial and increasing medication use comes a growing risk of harm [1].This is compounded by the need to prescribe for an ageing population with increasingly complex medical needs and the introduction of many new medications. These issues are particularly relevant in primary care. In many cases, prescribing is initiated in primary care and those initiated in the hospital may also be continued in primary care.In 2000, an expert group on learning from adverse events in the NHS, chaired by the Chief Medical Officer, reported that since 1985 there had been at least 13 episodes in which people (usually children) had been killed or paralyzed because of wrong administration of drugs by spinal injection; 12 involved vinca alkaloids; 10 were fatal [2]. Serious medication errors are uncommon, but it is salutary that it took so long to recognize that remedial action was needed in this case [3]. Even so, this error continues to be made [4].

Defining medication errors

There is no consensus about the definition of a medication error. A systematic literature review found 26 different terminologies employed for a medication error [5].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 health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labelling, packaging,and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use" [6].

This definition is broad and suggests that errors are preventable at different levels. Medication error has also been defined as a reduction in the probability of treatment being timely and effective, or an increase in the risk of harm relating to medicines and prescribing compared with generally accepted practice [7].

There are a number of different approaches to classifying medication errors [8]. One approach is to base the classification on the stage in the sequence of medication use process, such as prescribing, transcribing, dispensing, administration or monitoring. Another approach is to consider the types of errors occurring, such as wrong medication, dose,

frequency, administration route or patient. A further approach classifies errors according to whether they occur from mistakes made when planning actions (knowledge-based or rule-based mistakes) or errors in the execution of appropriately planned actions (action-based errors, known as "slips", or memory-based errors, known as "lapses"). Errors may also be classified according to their level of severity. These approaches are not mutually exclusive and there is no strong evidence to support particular methods of defining or classifying errors specifically in primary care. The approach taken will depend on the setting and the purpose of the classification.

Medication errors can occur in:

- **choosing a medicine**—irrational, inappropriate, and ineffective prescribing, under prescribing and overprescribing;
- **writing the prescription**—prescription errors, including illegibility;
- **manufacturing the formulation to be used**—wrong strength, contaminants or adulterants, wrong or misleading packaging;
- **dispensing the formulation**—wrong drug, wrong formulation, wrong label;
- administering or taking the drug—wrong dose, wrong route, wrong frequency, wrong duration;
- **monitoring therapy**—failing to alter therapy when required, erroneous alteration.

Some basic definitions

An error-An error is 'something incorrectly done through ignorance or inadvertence; a mistake, e.g. in calculation, judgement, speech, writing, action, etc. [9] or a failure to complete a planned action as intended, or the use of an incorrect plan of action to achieve a given aim [10]. Other definitions have been published [11].

Medical error- The failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim [12].

Medication error- Any error in the medication process, whether there are adverse consequences or not [13].

Adverse drug event- Any injury related to the use of a drug [14].Not all adverse drug events are caused by medical error, nor do all medication errors result in an adverse drug event [15].

Preventable adverse event- Harm that could be avoided through reasonable planning or proper execution of an action [16].

Near miss- The occurrence of an error that did not result in harm [16].

Slip- A failure to execute an action due to a routine behavior being misdirected [17].

Lapse- A failure to execute an action due to lapse in memory and a routine behavior being omitted [17].

Mistake- A knowledge-based error due to an incorrect thought process or analysis [17].

Error of omission- Failure to perform an appropriate action [16].

Error of commission- Performing an inappropriate action [16].

Causes of medication errors

A number of studies have examined factors associated with medication errors. The Commonwealth Fund International Health Policy survey compared factors associated with patient-reported medication errors across seven countries. In 11% of patients experiencing a medication error, risk factors included poor coordination of care, cost-related barriers to medical services or medicines, multimorbidity and hospitalization [18]. Other studies have found that medication errors are associated with increasing number of medications, childhood and older age, and specific medications and medications for certain disease states (e.g., musculoskeletal, oncology and immune suppression, dermatology, ophthalmology, otolaryngologic conditions, infections and cardiovascular) [19,20,21].

Factors that may influence medication errors[22,23]

Factors associated with health care professionals

- Lack of therapeutic training
- Inadequate drug knowledge and experience
- Inadequate knowledge of the patient
- Inadequate perception of risk
- Overworked or fatigued health care professionals
- Physical and emotional health issues
- Poor communication between health care professional andwith patients

Factors associated with patients

- Patient characteristics (e.g., personality, literacy and language barriers)
- Complexity of clinical case, including multiple health conditions, polypharmacy and high-risk medications

Factors associated with the work environment

- Workload and time pressures
- Distractions and interruptions (by both primary care staff and patients)
- Lack of standardized protocols and procedures
- Insufficient resources
- Issues with the physical work environment (e.g., lighting, temperature and ventilation)

Factors associated with medicines

- Naming of medicines
- Labelling and packaging

Factors associated with tasks

- Repetitive systems for ordering, processing and authorization
- Patient monitoring (dependent on practice, patient, other health care settings, prescriber)

Factors associated with computerized information systems

- Difficult processes for generating first prescriptions (e.g.drug pick lists, default dose regimens and missed alerts)
- Difficult processes for generating correct repeat prescriptions
- Lack of accuracy of patient records
- Inadequate design that allows for human error

Primary-secondary care interface

- Limited quality of communication with secondary care
- Little justification of secondary care recommendations

Frequency and outcomes of medication errors

The precise frequencies of medication errors are not known. The method of detection can affect the estimated frequency [24]. Probably most errors go unnoticed (the error iceberg [25]); of those that are detected a minority actually result in ADRs, or at least serious ones.

However, it is important to detect medication errors, whether important or not, since doing so may reveal a failure in the treatment process that could on another occasion lead to harm. There is also evidence that the death rate from medication errors is increasing. These increases are not surprising—in recent years' hospitals have seen increased throughput of patients, new drugs have emerged that are increasingly difficult to use safely and effectively, medical care has become more complex and specialized, and the population has aged, factors that tend to increase the risk of medication errors [26].

When errors are detected, they can cause much dissatisfaction. According to a 2000 report citing UK medical defence organizations,1 25% of all litigation claims in general medical practice were due to medication errors and involved the following errors:

- prescribing and dispensing errors (including a wrong, contraindicated or unlicensed drug, a wrong dosage, or wrong administration);
- repeat prescribing without proper checks;
- failure to monitor progress; and
- failure to warn about adverse effects (which might, however, not be regarded as a medication error).

Types of medication error and prevention

The best way to understand how medication errors happen and how to avoid them is to consider their classification, which can be contextual, modal, or psychological. Contextual classification deals with the specific time, place, medicines and people involved. Modal classification examines the ways in which errors occur (for example, by omission, repetition or substitution). Psychological classification is to be preferred, as it explains events rather than merely describing them. Its disadvantage is that it concentrates on human rather than systems sources of errors. The following psychological classification is based on the work of Reason on errors in general[27].There are four broad types of medication errors.

Knowledge-based errors (through lack of knowledge)—for example, giving penicillin, without having established whether the patient is allergic. These types of errors should be avoidable by being well informed about the drug being prescribed and the patient to whom it is being given. Computerized prescribing systems, bar-coded medication systems, and cross-checking by others (for example,

pharmacists and nurses) can help to intercept such errors [28]. Education is important [29].

Rule-based errors (using a bad rule or misapplying a good rule)—for example, injecting diclofenac into the lateral thigh rather than the buttock. Proper rules and education help to avoid these types of error, as do computerized prescribing systems.

Action-based errors (called slips)—for example, picking up a bottle containing diazepam from the pharmacy shelf when intending to take one containing diltiazem. In the Australian study mentioned above most errors were due to slips in attention that occurred during routine prescribing, dispensing or drug administration. These can be minimized by creating conditions in which they are unlikely (for example, by avoiding distractions, by cross checking, by labelling medicines clearly and by using identifiers, such as bar-codes);[30] so-called 'Tall Man' lettering (mixing upper- and lower-case letters in the same word) has been proposed as a way to avoid misreading of labels [31], but this method has not been tested in real conditions. A subset of action-based errors is the technical error—for example, putting the wrong amount of potassium chloride into an infusion bottle. This type of error can be prevented by the use of checklists, fail-safe systems and computerized reminders.

Memory-based errors (called lapses)—for example, giving penicillin, knowing the patient to be allergic, but forgetting. These are hard to avoid; they can be intercepted by computerized prescribing systems and by cross-checking.

For some examples of prescription errors see below Table.

Type of error	Example	Outcome
Knowledge based	Being unaware of the interaction between warfarin and erythromycin	Warfarin toxicity
Rule based	Prescribing oral treatment in a patient with dysphagia	Lung aspiration or failure to treat
Action based	Being distracted, writing diazepam for diltiazem	Sedation
Technical	Writing illegibly, so that 'Panadol' (paracetamol) is dispensed instead of 'Priadel' (lithium)	Loss of effect
Memory based	Forgetting to specify a maximum daily dose for an 'as required' drug	Poisoning or unnecessary treatment

What are the consequences of medication errors?

Medication errors are an important cause of patient morbidity and mortality [32]. Although only 10% of medication errors result in an ADE, these errors have profound implications for patients, families, and health care providers [33,34,35]. The IOM report highlights that 44,000 to 98,000 patients die each year as a result of medical errors, a large portion of these being medication-related [36].

Detecting and reporting errors

One difficulty in detecting errors is that those who make them fear disciplinary procedures and do not want to report them [37]. The establishment of a blame-free, non-punitive environment can obviate this [38]. The reporting of errors, including near-misses, should be encouraged, using error reports to identify areas of likeliest occurrence and simplifying and standardizing the steps in the treatment process. However, some systems for voluntarily reporting medical errors are of limited usefulness, because reports often lack details and there is incomplete reporting and underreporting [39]. A medication error reporting system should be readily accessible, with clear information on how to report a medication error, and reporting should be followed by feedback; detection may be improved by using a combination of methods [40].

Achieving balanced prescribing

Nine questions should be asked before writing a prescription (adapted from the Medication Appropriateness Index,[41,42]):

Indication: is there an indication for the drug?

Effectiveness: is the medication effective for the condition?

Diseases: are there important co-morbidities that could affect the response to the drug?

Other similar drugs: is the patient already taking another drug with the same action?
Interactions are there clinically important drug–drug interactions with other drugs that the patient is taking?

Dosage: what is the correct dosage regimen (dose, frequency, route, formulation)?

Orders: what are the correct directions for giving the drug and are they practical?

Period: what is the appropriate duration of therapy?

Economics: is the drug cost-effective? The mnemonic for this list is 'i.e. do I dope?'. Each item relates to an important process in prescribing, and in the absence of evidence that

following this schedule improves prescribing, it makes sense to use it.

Practical next steps

Safer primary care is an essential step in moving towards universal health coverage and person-centered care. Provision of primary care needs to be safe and of high quality in order to reduce reliance on hospital care. Addressing medication errors is a key component of improving the safety of primary care.

Medication errors are particularly important given the large and growing global volume of medication use. This is especially critical in primary care where a significant proportion of prescribing occurs. Differing definitions and approaches to the classification of medication errors lead to widely varying estimates of prevalence. Nonetheless, it is clear that medication errors can occur at a number of different stages of the medication prescription and use process. Although serious errors are relatively rare, the absolute number is sizeable, with the potential for considerable adverse health consequences.

A number of factors may contribute to errors in primary care, including those pertinent to the health care professionals, patient, work environment, medicines as a product, tasks, computerized information systems and primary-secondary care interface. This presents a range of opportunities for interventions. In terms of reducing error rates, those provided by clinical pharmacists are promising approaches.

In addition to health systems strengthening, Member States could consider prioritizing the following strategies to reduce medication errors in primary care:

1. Educating health care providers and patients

- Educating primary care providers about common causes of medication errors;
- Providing simple tools to assist primary care providers in safe medication prescribing and use process;
- Considering how patients can be actively involved in medicine management;

Providing patient engagement tools to address non-adherence.

2. Implementing medication reviews and reconciliation

- Ensuring that pharmacists actively review prescriptions;
- Encouraging and supporting use of medication reconciliation by clinicians

3. Using computerized systems

- Strengthening electronic prescribing and alert systems. Computerized provider order entry with decision support may be particularly effective when targeted at a limited number of potentially inappropriate medications and when designed to reduce the alert burden by focusing on clinically-relevant warnings.

II. CONCLUSION:
A PRESCRIPTION FOR BETTER PRESCRIBING

Patient safety is an important health care issue because of the consequences of iatrogenic injuries. We all make errors from time to time. There are many sources of medication errors and different ways of avoiding them. However, we must start by being aware that error is possible and take steps to minimize the risks. The essential components of this are monitoring for and identifying errors, reporting them in a blame-free environment, analysis of their root causes [43], changing procedures according to the lessons learnt and further monitoring.

How can we improve prescribing and reduce medication errors? Five prescriptions might

Help [44,45]:

- Education, to be taken as often as possible (a repeat prescription—learning should be lifelong).
- Special study modules for graduates and undergraduates, to be taken as required.
- Proper assessment: in the final undergraduate examination, to be taken once or twice; in postgraduate appraisal, to be taken occasionally; this could be linked to a license to prescribe.
- A national prescription form for hospitals, to be applied uniformly and used as a training tool.
- Guidelines and computerized prescribing systems, to be taken if indicated (their roles and proper implementation are not yet clear).

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