Patient Safety

World Health Organization

Medication without harm

Policy brief

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Acknowledgements

Acronyms

ADE   adverse drug event

ADR   adverse drug reaction

AMR   antimicrobial Resistance

LMICs   low- and middle-income countries

LASA   look-alike sound-alike

OECD   Organization for Economic Co-operation and Development

T&CM   traditional and complementary medicines

WHO   World Health Organization

Executive summary

Patient harm due to unsafe care is a leading cause of death and disability worldwide, and most of such harm is avoidable *(1)*. Harm due to medicines and therapeutic options accounted for nearly 50% of the overall preventable harm in medical care *(2)*. The pooled prevalence of preventable medication-related harm was 5% (1 in 20 patients) and one fourth of the harm was severe or potentially life-threatening *(3)*. The prevalence of preventable medication-related harm was nearly double, 7% (1 on 25 patients) in low- and middle-income countries (LMICs) compared to 4% (1 in 14 patients) in high-income countries.

This policy brief defines key concepts of medication safety and presents current evidence on the scale of the problem and the urgency of the situation. Medication errors occur throughout the medication use process; however, many recent studies indicate that most errors occur during prescribing and monitoring stages *(3, 4)*. Evidence of medication-related harm in several contexts and environments are discussed.

Policy options with benefits, advantages and opportunities to improve medication safety are suggested, including technological solutions. Establishment of medication safety committees within the organizational structure, appointing medication safety or patient safety officers and implementing national action plans on medication safety are recommended. Ensuring a culture of safety and managing changes to the culture in the workplace and in the health care system are important to improve medication safety. Reporting and learning systems for medication errors have been used in countries to identify errors, creating learning opportunities for preventing errors.

Methods for addressing the priorities identified in the third WHO Global Patient Safety Challenge: *Medication Without Harm* are discussed using the strategic framework, focussing on the four domains and the three key action areas. Solutions that could be used in countries are proposed under the four domains of the strategic framework: the patient and the public, health and care workers, medicines as products, and systems and practices of medication and the three action areas: high-risk situations, polypharmacy and transitions of care.

Key messages

Patient harm due to unsafe medical care is a leading cause of death and disability worldwide, and most patient harm is avoidable *(1)*.

One in 20 patients globally experience preventable medication related harm in medical care *(3)*
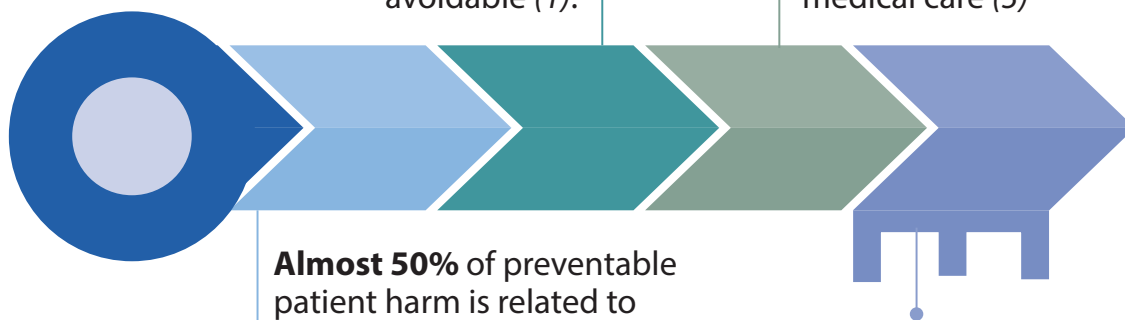
Almost 50% of preventable patient harm is related to medicines and therapeutic interventions *(2)*.

A quarter of preventable harm is considered severe or life-threatening *(3)*.

Errors can occur at various stages of the medication use process: prescribing, transcribing, ordering, storage, dispensing, preparation, administration and monitoring.

Globally most errors occur at the prescribing stage (53%) followed by the monitoring stage (36%), and in LMICs, almost 80% preventable errors occur at prescribing stage *(3)*.

The highest prevalence rates of preventable medication-related harm occur in elderly patient care units (17%) and among patients in highly specialized or surgical care (9%).

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Weak medication systems and/or human factors such as fatigue, burnout, poor environmental conditions or staff shortages contribute to medication errors.	Many interventions to reduce the frequency and impact of medication errors are available, but their implementation varies.	Patients in LMICs suffer greater harm than those in high-income countries.	Countries are urged to develop targeted national action plans on medication safety and implement them to prevent medication errors and reduce avoidable medication-related harm.

1

Introduction

Everyone in the world will, at some point, take medicines to prevent or treat illness. Although medicines have increased life expectancy and patients live longer with a better quality of life despite disease, medicines can also cause severe harm *(1)*. The trust that patients have in modern medicines and the health and care workers may also lead them to underestimate the risk of harm associated with medicines. Incidents related to medicines and other treatments account for the largest proportion of preventable patient harm *(2)*. Severe harm due to medication errors affects not only the lives of patients and families but also the health and care workers, who are "second victims of harm". Errors often occur in settings with weak health systems and practices and improving the culture of safety by various interventions can prevent medication errors. The report by the Institute of Medicine in the Unites States of America, *To err is human* in 1999 *(5)*, shone a spotlight on preventable medical errors, and since its release, patient safety has become a priority in health care. Although harm during medical care poses a substantial burden on the world's population, much of the evidence is from developed countries, whereas patients in Low-and Middle-Income Countries (LMICs) lose twice as many disability-adjusted life years due to medication-related harm than those in high-income countries *(6)*. The highest prevalence rates of preventable medication-related harm were in the African (9%) and South-East Asian (9%) regions *(3)*.

Medication errors contribute 9% of the world's total avoidable cost of health care, and 0.7% of total health expenditure worldwide, which amounts to US$ 42 billion estimated to be spent on medication errors *(7)*. The Organisation for Economic Corporation and Development (OECD) report in 2022 indicated that 1 in 10 hospitalisations in OECD countries occur due to medication related harm and 1 in 5 hospitalised patients experience medication related harm. The OECD report estimated the annual cost of medication related harm in OECD countries alone to be over USD 54 million *(8)*. This figure is equivalent to 11% of total pharmaceutical spending across 31 OECD countries. As the global population ages, more people will live with several rather than one disease, requiring many medicines *(8)*. When providing access to health care for all, with universal health coverage, we must ensure that we do not harm patients due to the medicines they are given.

Dispensing medicines, photo credit: WHO/Sergey Volkov

This policy brief is aimed at creating awareness on the extent of global harm that occurs due to medication errors and explains the strategic framework proposed by WHO for member states, institutions, and facilities to address medication related harm. The framework was introduced with the launch of the third Global Patient Safety Challenge: *Medication Without Harm* by WHO in 2017 with the aim of reducing severe patient harm due to medication errors by 50% *(9, 10)*. This document provides information to all stakeholders including, health and care workers, policymakers, healthcare facilities, institutions and patient care organizations on the extent of preventable medication related harm and the urgency to detect, address and prevent such harm. It also includes points for consideration by Member States, organizations, manufacturers and regulators to implement strategies to ensure medication safety, as applicable to them. To consolidate activities initiated on the Challenge, WHO selected *'Medication Without Harm'* as the theme for the World Patient Safety Day 2022 *(11)*. The Day provided an opportunity for health care leaders to drive change and work together with all stakeholders to make a difference in the lives of patients, families and to encourage health and care workers on the front line to implement the interventions proposed in the Challenge. This policy brief will help all stakeholders to identify policy level initiatives to ensure medication safety at all levels of heath care and in taking forward the activities initiated during the Global Patient Safety Challenge and the World Patient Safety Day 2022 on the theme *"Medication Without Harm".*

1.1 Key concepts

Adverse drug events, adverse drug reactions and medication errors

Medicines may result in adverse drug events (ADEs), which are defined as "any injury resulting from medical interventions related to a drug" including both adverse drug reactions in which no error was involved as well as complications resulting from medication errors *(12)*. Some ADEs are preventable and predictable, while other reactions to medicines are not predictable. The latter are known as adverse drug reactions (ADRs), defined as "a response to a drug which is noxious and unintended and that occurs at doses used in humans for prophylaxis, diagnosis or therapy of diseases or for the modification of physiological function" *(13)*. Preventable ADEs are medication errors, defined 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, healthcare products, procedures, and systems, including prescribing, order communication, product labelling, packaging and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use." *(14, 15)*. The relationship between adverse drug events, and medication errors are given in Figure 1 *(16)*.

Figure 1. Relations between medication errors and adverse drug events
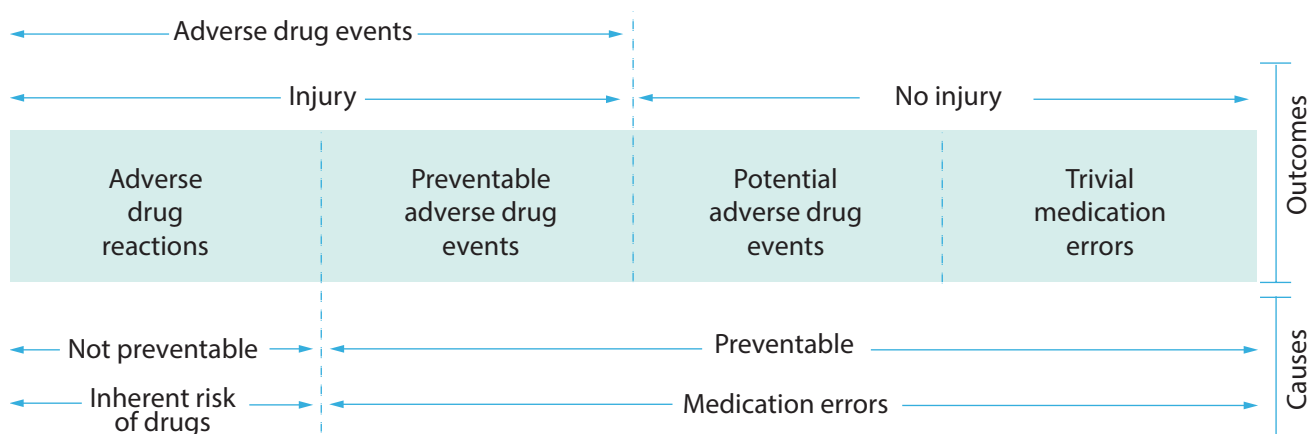
Source: Reproduced, with the permission of the publisher, from Otero and Schmitt *(16)*.

1.2 Background

The Seventy-second World Health Assembly (WHA) in 2019 adopted the resolution on Global action on patient safety considering that patient safety is a growing challenge to health service delivery globally *(1)*. Subsequently, the Global Patient Safety Action Plan (GPSAP) 2021-2030 was endorsed by the Seventy-fourth WHA in 2021, aiming to provide WHO Member States and other stakeholders with an action-oriented framework to facilitate the implementation of strategic patient safety interventions across health systems, over the next 10 years, 2021–2030. The implementation of the third WHO Global Patient Safety Challenge: *Medication Without Harm* launched in 2017 is included under the Strategic Objective 1, Policies to eliminate avoidable harm in health care and Strategic Objective 3, Safety of clinical processes of the GPSAP. Specifically, the strategy 1.5 calls to Commit to prioritize and take action to achieve the goals of the Global Patient Safety Challenges with required leadership, coordination, expert advisory structures, and monitoring and evaluation, and the strategy 3.2 proposes the countries to Implement a programme to transform the safety of medication management and use, based on the third WHO Global Patient Safety Challenge: *Medication Without Harm (1)*.

The principle of the *Challenge* is that errors are not inevitable; the challenge is to reduce the prevalence of medication errors by addressing weaknesses in health care systems and practices. To achieve this, multilevel interventions are necessary at global, regional, national and facility levels and on the front line. The strategic framework proposed with three priority areas to focus and four domains under the Global Patient Safety Challenge: *Medication Without Harm*, are discussed in sections 4.3 and 4.4.

Medicines are used in health care to cure and prevent diseases and to mitigate symptoms in all age groups. Medicines may be prescribed to patients by an appropriately qualified health professional or sometimes by informal health workers. They also may include products that have been purchased by patients or their carers for self-medication, such as Traditional and Complementary Medicine (T&CM) products for use with or in place of prescribed medicines. A systematic review reported an estimated average of about 58% people in Sub-Saharan Africa using T&CM products *(17)*. Safety is a fundamental principle in the provision of T&CM medicines too, as adverse events may arise due to mistaken use of the wrong species of medicinal plants, wrong selection of raw or processed plant components and incorrect dosing.

Use of medicines has increased because of increased adherence to disease-based guidance. The increase in use also results, however in increased hazards, errors and adverse events associated with medicines, which can be reduced or even prevented by improving the systems and practice of medication.

2

Errors during the medication use process

The process of medication involves different healthcare professionals, mainly doctors, pharmacists and nurses, working in many settings. An error occurring at any stage that reaches a patient may result in harm and could involve everyone in the medication use process as well as the system in which they work. The definition or description of errors at each stage of the medication use process and the error rates that have been reported are summarized below.

2.1 Prescribing

Prescribing errors defined as a mistake made by the prescriber when ordering a medication occur during prescription of a medicine, while writing a medication order or taking a therapeutic decision *(15)*. It can also include failure to prescribe a drug necessary to treat a diagnosed disease or to prevent the adverse effects of other drugs.

A recent systematic review found that the highest prevalence of preventable medication errors occurred during the prescribing stage of the medication use process, with an error rate of 53% *(3)*. A systematic review of studies in hospitalized patients reported a median prescribing error rate of 7% in medication orders *(18)*. The prescribing errors included errors in indication, drug–disease interactions, drug–drug interactions, dosing errors and inappropriate prescribing. The prescribing error rates reported in primary-care settings, care homes and secondary care in England were 4.2%, 8.3% and 9.0%, respectively *(19)*, indicating that more prescribing errors occur in hospitals. Much higher prescribing error rates are reported from LMICs, with a pooled prevalence of 78 % from 30 studies from the WHO study *(3)* and error rates are up to 90% in some studies *(20-22)*. Poor legibility seen in about 50% of prescriptions, incompleteness or errors in information about the patient and the medicines were contributory factors for errors in hand-written prescriptions in many LMICs *(23, 24)*.

Doctor prescribing medicines, photo credit: WHO/Fernando G. Revilla

2.2 Transcribing

Transcribing errors occur during order communication due to incorrect data recording by health and care workers *(25)*. A study defined transcribing error in hospital practice as, any discrepancy between the physician's medication order and the medication order written onto any document related to the patient concerned such as the medical record, medication chart, medication request sheet, discharge medication chart or any other similar document *(26)*. The reported transcribing error rates varied from 15% to 70% *(20)*. In another study, the rate of discrepancy between the medicines described by patients or caregivers and the medicines listed by their general practitioners or listed on the discharge letter or patient's discharge medication list was 24% *(27)*.

2.3 Dispensing

Dispensing errors are defined as deviation from the prescriber's order, made by staff in the pharmacy when distributing medicines to nursing units or to patients in an ambulatory pharmacy setting *(15)*. A systematic review reported dispensing error rates between 0.015–33% *(28)*. The most common factors associated with dispensing errors were high workload, low staffing, mix-up of "look-alike, sound-alike" (LASA) medicines, lack of knowledge or experience, distractions or interruptions, and communication problems within the dispensing team *(29)*.

Picking up medicines for the child at the pharmacy, photo credit: WHO/Harold Ruiz

2.4 Administration

Any discrepancy between how a medicine is given to a patient and the directions for administration from the physician or hospital guidelines is regarded as an administration error *(15)*. The WHO systematic review reported that overall prevalence of administration errors was 22% *(3)* while the median rate of administration errors excluding errors in administration time was 10.5% *(30)*.

2.5 Monitoring

Failure to review a prescribed regimen for appropriateness and to detect problems or failure to use appropriate clinical or laboratory data for assessment of the patient's response according to prescription theory is termed a monitoring error *(15)*. Monitoring errors were the next most common preventable medication errors after prescribing errors, with error rates of 36% and 47% reported in systematic reviews *(3, 4)*.

3

Scale of errors and contributory factors

Unsafe care is one of the leading causes of morbidity and mortality in the world. It occurs at all levels of health care in countries, regardless of their income status. An average of one in 10 patients in high-income countries is subjected to an adverse event during hospitalization *(31)*. Estimates for LMICs suggest up to one in four patients is harmed, with 134 million adverse events occurring in hospitals annually, contributing to about 2.6 million deaths *(1, 32)*. In a meta-analysis of 70 studies involving 337 025 patients, incidents related to drugs (25%) and other treatments (24%) accounted for the largest proportions of preventable patient harm *(2)*. In primary and ambulatory care in the OECD countries, as many as 4 of 10 patients are harmed due to errors in care, and up to 80% of the harm could be avoided *(33)*. In an OECD report, it was estimated that 15% of hospital expenditure and activity in those countries can be attributed to treating safety failures, medication error being a common cause *(34)*.

Medication errors and error-related ADEs occur in all health care settings which are responsible for considerable harm to patients *(35)*. The recent systematic review of 100 studies on preventable medication harm indicated that one in 20 patients is exposed to medication errors, of which 26% are considered severe or life-threatening *(3)*. In the study, the prevalence of preventable medication related harm in LMIC was 6.9% (1 in 15 patients) while in HICs prevalence was 4% (1 in 25 patients). The highest prevalence rates for preventable medication-related harm was found in elderly patient care units (17%), highly specialized or surgical care (9%), intensive care units (7%) and emergency departments (6%) *(3)*.

In England, it was estimated that 237 million medication errors occur each year, causing 712 deaths and contributing to another 1708 deaths during initial hospitalization *(36)*. Preventable ADRs were estimated to cost the National Health Service £98.5 million per annum *(36)*. Most of the available studies have been conducted in hospitals, although there is an international move to manage care in primary care, ambulatory settings or patients' homes. The pooled prevalence of ADRs in primary care has been shown to be 8.32% in a recent systematic review *(37)* and in English general practice, most were prescribing/ monitoring errors *(38)*.

Although data on patient harm are reported less often from LMICs than high-income countries, the available data indicate a higher prevalence of preventable patient harm in LMICs. A retrospective case record review involving 8 developing countries reported at least 1 adverse event in 8.2% of 15, 548 records reviewed with a range of 2.5-18.4% per country *(39)*. Of the adverse events, 83% were judged to be preventable and about 30% were associated with deaths of the patient; 34% of the adverse events were therapeutic errors in relatively non-complex clinical situations *(39)*. The available evidence of risks to patient safety associated with medication globally calls for new strategies to manage the risks.

Studies on medication errors have identified contributory factors related to patients, health and care workers and medications. They include the number of medicines used by a patient, the number of comorbid conditions, the use of high-risk (high-alert) medicines and involvement of several health and

care workers in care. A study on hospital admissions for drug-related events identified older age, starting new high-risk medicines and receiving more than 5 medicines as the risk factors *(40)*. A systematic review reported prescription of certain medicines or classes of medicines, polypharmacy, older age, female gender, poor renal or hepatic function, having many comorbid conditions, length of hospital stay, history of drug allergy or sensitivity and the compliance of the patient as risk factors necessitating pharmaceutical interventions *(41)*. Some of these factors are discussed in detail below.

3.1   Extremes of age

Medication errors are most likely to occur in very young and older persons, who are less likely to tolerate ADRs and have more severe outcomes. Recent systematic review on preventable medication-related harm reported highest prevalence rates of 17% in elderly patient care units *(3)*. A systematic review of the incidence and nature of medication errors in children showed a wide variation in incidence and identified it as a concern for paediatric population *(42)*. In very young children, the body systems such as the liver and kidney that are responsible for eliminating medicines from the body may not be fully developed, increasing the likelihood of harm. Calculation of drug doses according to the weight of children is one reason for errors.

Older persons react differently from younger people to medicines, because of changes in organ function, the muscle: body-fat ratio and the rate of clearance of medicines. They are therefore at increased risk of medication-related harm *(43)*. Age-related physiological impairment and comorbid conditions require the use of several medicines, increasing susceptibility to adverse effects, drug–drug interactions and drug–condition interactions *(44)*. In older people, 25–40% of hospital admissions were found to be linked to medication errors *(40)*. Furthermore, older people often take psychotropic medicines, increasing the

Older patient with the daily medicines, photo credit: WHO/Quinn Mattingly

likelihood of falls *(45)*. In residential care facilities, the rate of falls is much higher than elsewhere, and they progress to more serious complications *(46)*. Use of opioids, antiepileptics and polypharmacy was significantly associated with an increased risk of falling *(47)*. Reduced cognitive function in older persons increases the risk of wandering and acquiring injuries due to falls *(48)*. Patients with dementia tend to have more comorbid conditions and are more likely to have prescriptions for more medicines, which increases their risk of polypharmacy-related safety issues *(49)*.

3.2 Multimorbidity

Multimorbidity is defined as the presence of two or more long-term health conditions *(50, 51)*. Epidemiological data indicate that multimorbidity increases markedly with age and is present in almost two thirds of individuals aged over 80 years *(50)*. In a general practice, 27% of patients had multimorbidity *(51)*. On average, people with multimorbidity have at least three long-term conditions, cardiovascular (88%), metabolic (62%) and rheumatic conditions (40%) being the commonest. A meta-analysis of studies of primary care showed that multimorbidity involving physical and mental conditions was associated with an increased risk for "active patient safety incidents", including prescribing errors *(52)*. Multimorbidity poses an increased economic burden due to greater use of health services, including community-based health services and hospitalization (three times higher), in some cases due to harm from medicines *(53-55)*.

Frailty should be considered independently of age and multimorbidity. In a systematic review, frail patients were found to be more likely to receive several and to be at increased risk of harm *(56)*. These patients have higher risks of hospitalization, disability and mortality *(57, 58)*.

3.3 Polypharmacy

Concurrent use of several medicines is referred to as polypharmacy. Although there is no standard definition, polypharmacy is usually defined as concurrent use of five or more medicines that include over-the-counter, prescription and/or T&CM products *(59, 60)*. More medicines might, however, be required and appropriate for some patients. Certain criteria can be used to determine the appropriateness of polypharmacy *(59)*.

Polypharmacy is a growing problem with increased longevity and multimorbidity. Complex treatment regimens also present a risk of non-adherence. These factors increase the likelihood of morbidity, unplanned admissions, readmissions and prolonged hospital stays.

Despite extensive advances in pharmacotherapy, few clinical guidelines are available for adults with multiple morbidities. Prescribing is largely based on evidence-based guidance for single diseases, which does not generally consider multimorbidity *(61, 62)*. Consequently, patients are often prescribed several medicines recommended by different specialists according to disease-specific guidelines, which, in combination, make management of multimorbidity difficult and may lead to patient harm *(63)*.

3.4 High-risk (high-alert) medicines

Many medicines pose a higher risk of harm when used in error or inappropriately. These are referred to as "high-risk (high-alert) medicines" *(64, 65)*, and the specific medicines identified may differ from country to country. A systematic review reported error rates ranging from 0·24 to 89·6 per 100 medication orders that occur due to high-alert medicines *(66)*. Use of these medicines by vulnerable groups such as children and the elderly may increase the risk of harm. In hospitals, the medicines commonly implicated as high-risk are anti-infective agents, potassium and other electrolytes, opioids and other sedatives, chemotherapeutic agents, heparin and anticoagulants *(64)*. Medicines commonly implicated in primary care include

antiplatelets, diuretics, anticoagulants and non-steroidal anti-inflammatory drugs. The Institute for Safe Medicine Practices has identified high-alert medicines lists used in acute care settings *(65)*, community and ambulatory care settings *(67)*, and these lists can be used as guides by countries or institutions that do not have their own lists of high-risk medicines.

3.5   Antimicrobials and resistance

Inappropriate and increasing use of antimicrobials has led to the development of resistance, which is a global concern. Antimicrobial resistance (AMR) has made many infections, particularly bacterial infections, increasingly difficult or even impossible to treat. Without effective medicines, the number of people with severe microbial infections will increase, resulting in an increase in the number of people who die from these infections *(68)*. In 2019, 4.95 million deaths were associated with AMR, with the highest death rates attributable to AMR occurring in western sub-Saharan Africa at an estimated 27.3 deaths per 100,000 *(69)*. The six leading pathogens for deaths associated with resistance in 2019 were *Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus pneumoniae, Acinetobacter baumannii,* and *Pseudomonas aeruginosa*, responsible for nearly 1 million deaths *(69)*. The rate of resistance to the commonly used antibiotic ciprofloxacin, varied from 8.4% to 92.9% for *Escherichia coli* and from 4.1% to 79.4% for *Klebsiella pneumoniae* in countries reporting to the WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) *(70)*. Antimicrobials could also cause allergic reactions, including anaphylaxis and death, other adverse effects in various systems and *Clostridium difficile* infections after prolonged use *(71)*.

3.6   Palliative care

Most medical errors in palliative care are related to medicines used for symptom control, particularly opioid analgesics *(72)*. Erroneous selection of medicines or of their dosage or administration can result in either undertreatment of distressing symptoms or intoxication, both causing unnecessary suffering for the patient. Opioids are high-risk medicines, and 84% of errors in one study were due to opioids *(73)*. Most errors involved morphine (35%) or hydro morphine (29%). Patients were more likely to receive a lower dose of an opioid than ordered, as a direct result of an error (57%) and such errors adversely impact pain and/or symptom management in 42% of patients. A systematic review, however, showed paucity of information on the incidence, types and patient impact of opioid errors in adult oncology and palliative care *(74)*. Defining, identifying and quantifying error reporting practices for these populations should be a component of medication safety initiatives in palliative care.

3.7   Transitions of care

Unintended discrepancies in medication can arise when patients transit through care settings. Transitions of care are the physical locations or contacts with a health care professional to which a patient moves or returns to receive health care *(75)*. A Cochrane review found that 56% of people are at risk of having one or more medication-related discrepancies, and 11–59% are potentially at risk of harm during care transitions *(76)*. Discrepancies in medication orders are common, and they increase with the number of medicines prescribed. At transitions of care, polypharmacy and an insufficient knowledge of the patients' medication history are important causes of prescribing errors *(77)*. Another systematic review reported a median rate of medication error or unintentional medication discrepancy of nearly 50% in adult and elderly patients after hospital discharge *(78)*. About 20% of adult and elderly patients were affected by ADEs after hospital discharge. Although most of the studies were conducted in high-income countries, such discrepancies have also been observed in LMICs *(79-81)*.

3.8 Medicines as products

Substandard and falsified medicines

The safety and quality of medicines in different countries varies. One of the main causes of medication-related harm globally is substandard and falsified medicines *(82-84)*. Patient harm occurs when patients do not receive the expected benefits, due to substandard medicines and when they are exposed to harmful chemicals used to adulterate medical products.

The global prevalence of poor-quality medicines in a study in 2018 was 13.6%, with a regional prevalence of 18.7% in Africa and 13.7% in Asia *(82)*. In the same study, 19.1% of antimalarials and 12.4% of antibiotics were substandard or falsified. The global total value of falsified medicinal products was US$ 4.4 billion in 2016 *(83)*. An estimated 1 in 10 medical products in LMICs is substandard or falsified *(84)*, and LMICs spend an estimated US$ 30.5 billion on such medicines, representing 10.5% of medicines sampled in the supply chain in these countries *(85)*. Products subjected to fraudulent activities, apart from antimicrobials, include medicines for pain management, diabetes and cancer. Substandard and falsified antimicrobials contribute to antimicrobial resistance.

Figure 2a. Examples of tablets of LASA medicines

Source : Reproduced from World Health Organisation publication (86).

"Look-alike and sound-alike" medicines

The names, packaging or labelling of medicines can be confusing, and clear information is sometimes lacking. Confusing "look-alike and sound-alike" (LASA) names, labelling and packaging are frequent sources of error and medication-related harm, with 6–14% of all errors due to LASA products *(86, 87)*. LASA pairs identified are published by the Institute for Safe Medication Practices, and "tall man lettering" with capitalisation of confused letters can be used to identify these medicines accurately *(88)*.

Figure 2b. Examples of some injectable products of LASA medicines
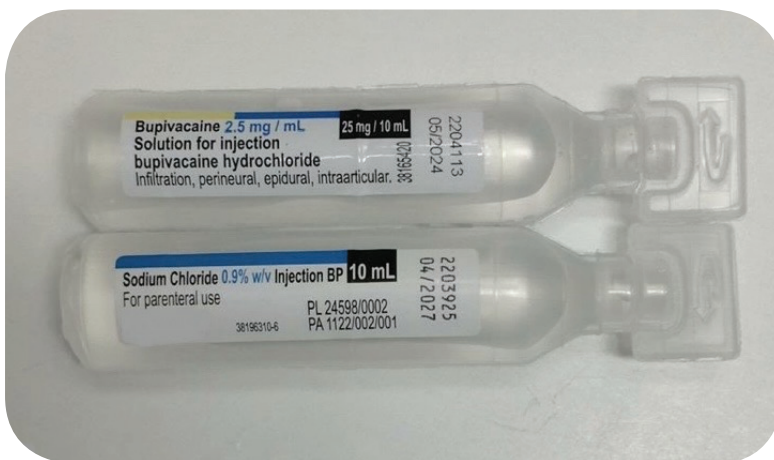
Source : Reproduced from World Health Organisation publication *(86)*.

Medicines more likely to cause harm

Some medicines are more closely associated with harm than others. The medicines associated with more preventable ADEs include anticoagulants or antiplatelets, cardiovascular medicines, diuretics, hypoglycaemics analgesics, antibiotics and antiepileptic medicines, *(37, 78)*. The metanalysis of studies on preventable medication harm has identified that medicines for nervous system conditions (21%) cardiovascular diseases (16%), anti-inflammatory and antirheumatic drugs (15%), antimicrobials (12%) and anti-thrombotics (11%) were the medicines or medicine classes most commonly responsible for harm *(3)*. Certain genetic factors can predispose to adverse drug reactions *(89)* and in the presence of known genetic factors, prescribing certain medicines can also result in a medication error.

Traditional and complementary medicines

There are regulatory and cultural differences in the preparation and use of allopathic and T&CM products. A critical component is quality control of T&CM products, important from the perspective of patient safety. Incorrect, and inappropriate usage of T&CM, even though of natural origin can lead to unwanted effects. Moreover, some medicinal plants are inherently toxic. Similarity in the colour, consistency, aroma and the taste of the pieces of raw herbs, powders or liquid herbal preparations and colour, shape, size of the tablets and capsules can contribute to errors with T&CM products too *(87)*. Several medicinal plants are known by dissimilar common names in different languages in different parts of the world, which could lead to wrong identification. Adverse events may also arise from the mistaken use of the wrong species of medicinal plants, incorrect dosing, or errors in the use of herbal medicines both by health-care providers and consumers.

3.9 Health and care workers

Use of medicines involves collaboration among several health and care workers throughout the process. Physical factors such as fatigue, burnout, distraction and interruption, poor information transfer and psychological factors related to inexperience, workload and insufficient decision support were given as reasons for errors by health care staff *(90, 91)*. Physician burnout doubled the patient safety incident rate and burnout was greatest in physicians still in training or residency, in those who worked in hospitals, specifically in emergency medicines or working in LMIC settings *(91)*. Evidence also shows that unacceptable behaviour of health and care workers negatively affects their clinical performance, quality of care, workplace productivity and patient outcomes *(92)*.

Doctors, pharmacists and nurses are the main health care providers involved in the medication process. They may experience a variety of emotions after a medication error, including guilt, shame, anxiety, fear and depression *(93)*. Health care providers involved in adverse events who subsequently have difficulty in coping with their emotions are thus considered "second victims" of patient safety incidents who need to be supported *(94)*.

Physician training the medical staff, photo credit: WHO/Winnie Romeril

Informal health care providers, who function as health workers in LMICs *(95)*, often provide medicines to patients, which may be a risk factor for medication safety and patient harm due to lack of knowledge, expertise, and poor adherence to national clinical guidelines. Delegation of medication related responsibilities is more acceptable within a framework that adequately supports them in the process, backed by appropriate policy, skills, training, and supervisory arrangements *(96)*.

3.10 Health care systems

The health care environment is an important determinant of the risk of medication errors. The systems and environment in high-income countries, with electronic prescribing, bar-coded dispensing, automated devices for administration and established error reporting and learning systems, is more likely to prevent medication errors *(29)*. Health care systems in most LMICs involve handwritten prescriptions, manual dispensing of medicines to large number of patients with no clinical pharmacy services to back up prescribers *(20-24)*. In addition, there is under-reporting of errors due to factors such as health care providers' workload, lack of reporting systems, education, training, institutional policies and protocols, and the fear of disciplinary action.

The system factors that contribute to medication errors may differ in different settings such as perioperative care *(97)*. Lack of medication reconciliation, weak drug distribution systems, poor-quality prescriptions, deviation from procedures, including distractions during administration and excessive workloads are other system factors that contribute to errors *(98)*.

4

Policy options to address medication errors

Clear policies, organizational leadership, data for improving safety, skilled health and care workers and effective involvement of patients in their care are all necessary to ensure sustainable, significant improvements in the safety of health care *(99)*. WHO initiated its third Global Patient Safety Challenge: *Medication Without Harm* to address several issues related to medication safety, including strengthening systems to reduce errors and avoidable harm on the principle that many errors are not inevitable but are provoked by weak health care systems. The *Challenge* also seeks to reduce the frequency of medication errors and their impact by tackling some of the inherent system weaknesses.

Countries are encouraged to identify their own priorities and the actions necessary to address the issues using this framework. Each country needs to assess its current status on medication safety, based on local evidence and address the four domains and three priority areas outlined in the strategic framework. It is proposed that countries prioritize action on medication safety, designate leaders to drive action and devise their own programmes based on local priorities.

The policy options to address medication safety, according to benefits, advantages and opportunities, include use of technology-based solutions where available, formation of medication safety committees in their organizational structure, appointing medication safety or patient safety officers, and implementing national action plans on medication safety. Some of the key policy options to consider are described in detail below.

4.1 Safety culture and managing change

A culture of safety in the workplace or health care system is necessary to ensure medication safety. A systems approach is taken in patient safety, as many factors must be addressed to reduce harm *(100)*. A systems approach includes the conditions in which individuals work and attempts to build defences to avert errors or mitigate their effects. The "Swiss cheese" model as applied to medication safety illustrates potential defences throughout medicines use (Fig. 2). A culture of safety has five attributes to be operationalized by health workers through safety management systems *(15)*:

◗ All workers accept responsibility for the safety of themselves, their co-workers, patients and visitors.

◗ Workers prioritize safety over financial and operational goals.

◗ The system encourages and rewards the identification, communication and resolution of safety issues.

◗ The system provides for organizational learning from accidents.

◗ The system provides appropriate resources, structure and accountability to maintain effective safety systems.

Teamwork and communication training interventions improved the safety culture in emergency department settings and may positively affect patient outcome *(101)*. Organizations with an effective culture of safety are committed to safety as a high priority throughout the organization. Failure to account for organizational safety culture is one of the main reasons that planned change initiatives are unable to overcome barriers. Not only the culture of the health system but also the cultural norms in different professions require due consideration.

Figure 3. "Swiss cheese" model as applied to medication safety
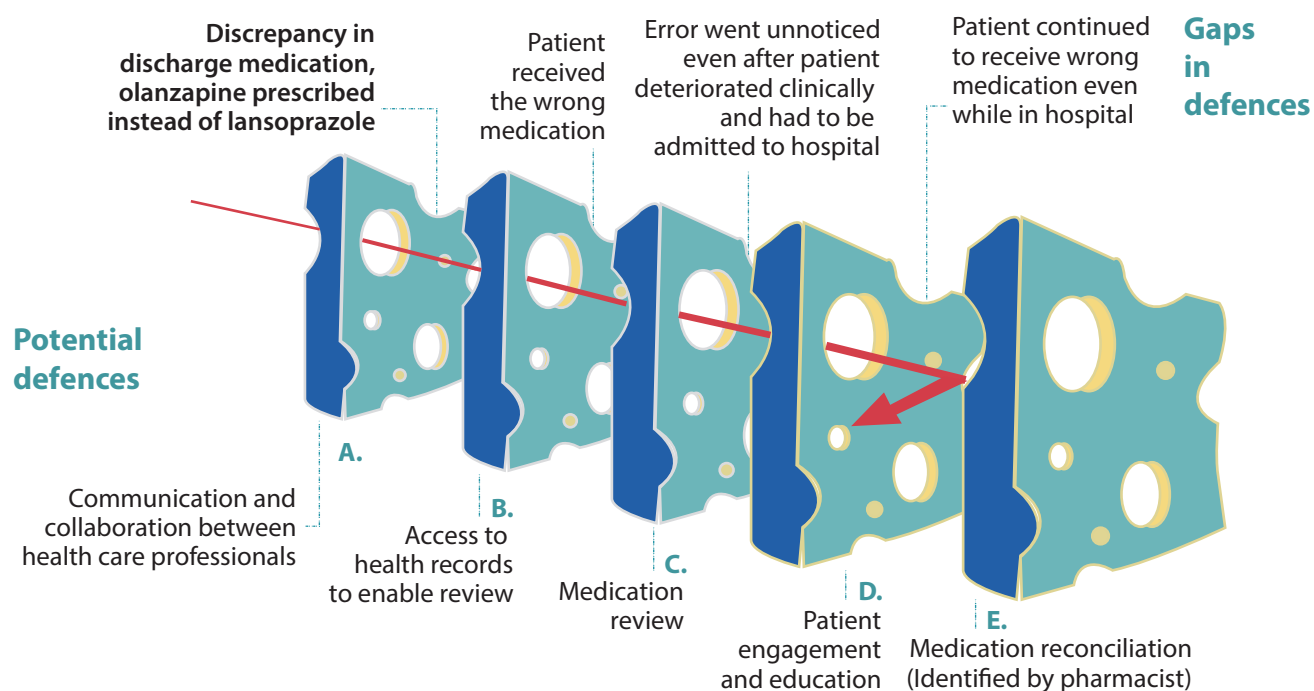
Source: Adapted with the permission of the publisher, from Reason J *(100)* and reproduced from World Health Organization, Technical report *(75)*.

4.2 Reporting medication errors and learning

The role of a patient safety reporting and learning system is to improve patient safety by learning from failures *(102)*. The national reporting systems in countries identify the common errors reported especially those that have caused serious patient harm and learn from those to take preventive actions *(103)*. Although each event is unique, likely similarities and patterns in sources of risk can be used to prevent similar incidents. European Union legislation passed in 2015 requires information on medication errors to be collected and reported through national pharmacovigilance systems for evaluation and assessment *(104)*. A clear distinction is made between adverse drug reactions which are not preventable, medication errors, resulting in preventable adverse events, medication errors that do not cause harm, intercepted medication errors and potential errors. National authorities responsible for pharmacovigilance are requested to collaborate and exchange information on medication errors resulting in patient harm with national patient safety organizations. The reporting systems should also allow reporting by patients and include reporting of errors or adverse events related to T&CM products to identify errors and to implement preventive strategies related to T&CM products.

LMICs face many challenges regarding pharmacovigilance and medication error reporting *(105)*. They have limited integration of pharmacovigilance systems, reporting tools need to be translated into local languages, there are few well-trained pharmacovigilance personnel, and they have little budgetary support from their national governments. Health and care workers are less aware of error reporting, and a

culture of blame contributes to very low reporting rates and poor-quality spontaneous reports, which limit learning from reports. Countries need to address these factors to establish effective error-reporting and learning systems.

4.3 The three key action areas of the strategic framework

The WHO Global Patient Safety Challenge: *Medication Without Harm* introduced a strategic framework with three key action areas: high-risk situations, polypharmacy and transitions of care and highlights four domains in which medication safety may be compromised: patients and the public, health and care workers, medicines as products, and systems and practices of medicines use. (see figure 3)

Figure 4. Four domains, 16 subdomains and three action areas of the strategic framework
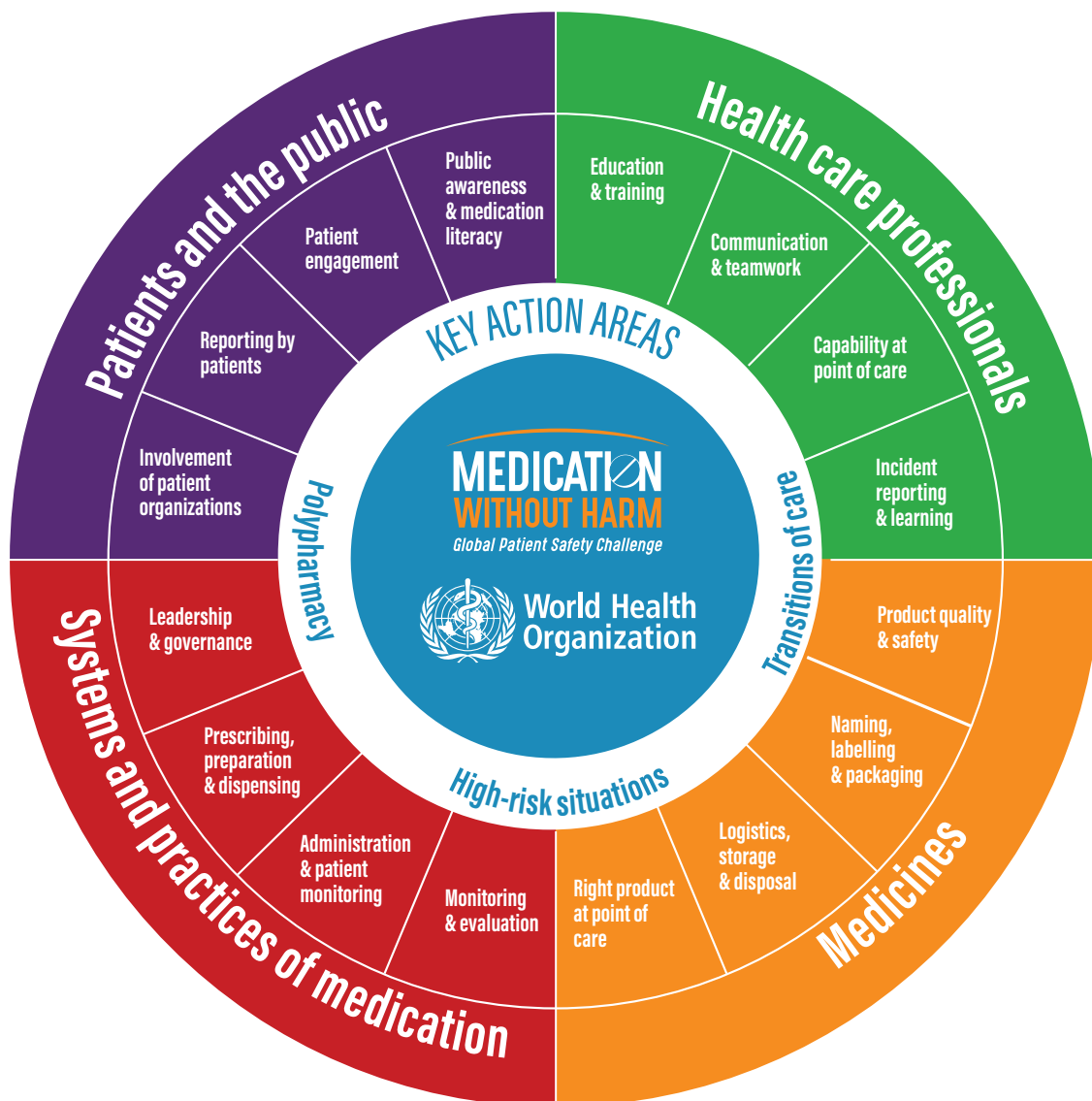
4.3.1 High-risk situations

The WHO technical report *Medication safety in high-risk situations (64)* elaborates four broad factors that influence medication safety in high-risk situations: medication, provider, patient and systems factors. Because of the complexity of health systems, a single strategy is rarely sufficient for addressing the risks associated with each high-risk medication. The following measures may be considered *(64)*:

- **Draw up a list of high-risk medicines:** A list for each country or setting is preferred to focus action on errors that occur locally.

- **Combine many error reduction strategies:** Choose risk reduction strategies that affect as many steps of the medication management system as possible. Examples include having forcing functions (see Glossary), in computerised systems (e.g., need to enter patient's essential details including laboratory results before allowing to prescribe some high-alert medicines or a dose) and other strategies such as staff education and passive information dissemination on high-risk situations.

- **Name, package and label LASA medicines and high-alert medicines:** label according to recommendations such as with "tall man" lettering and using high alert labels *(86, 87)*.

- **Use strategies that have been implemented successfully:** these are often proven effective, are recommended by experts and are sustainable *(106, 107)*.

- **Use standardized medication charts with limited use of abbreviations and symbols:** after introduction of the national inpatient medication chart in Australia, the number of prescribing errors per patient decreased by almost one third *(108)*.

Patients in a hospital, photo credit: WHO/Emmanuel Eraly

4.3.2 Polypharmacy

As polypharmacy is identified as an important contributory factor for medication errors, programmes to reduce inappropriate polypharmacy that are sustainable and can be delivered throughout the healthcare systems are recommended *(59)*. Actions to be considered include the following:

- **Review of medicines at initiation and at care transitions:** a seven-step method for conducting a medication review is proposed *(59)*. Pharmacist-led medication reviews and reconciliation reduced the number of hospital admissions *(109)*. Medication reviews can reduce ADEs in older people living in the community and in residential aged care facilities *(110, 111)*.

Pharmacist dispensing medicines, photo credit: WHO/Eduardo Martino

- **De-prescribing:** consist of tapering off, stopping, discontinuing or withdrawing medicines. Deprescribing, minimizes the dosage, the number of tablets and the frequency of administration *(112)*. STOPP/START criteria have been used in de-prescribing and ensuring the use of indicated medicines *(113)*.

- **Adding an indication to a prescription:** shown to be useful for detecting inappropriate polypharmacy *(114)*.

- **Prioritizing patients for medication review:** they include residents of care homes, patients on high-alert medicines, patients taking 10 or more medicines, patients with two or more comorbid conditions, frail patients, those with dementia and patients in palliative care *(115)*.

4.3.3 Transitions of care

Many medication discrepancies are noted to occur during care transitions *(75)*. Solutions to ensure medication safety at transitions of care include involving people, technology, systems and processes. Some interventions known to reduce errors are listed below:

- **Medication reconciliation programmes:** medication reconciliation facilitates transfer of accurate, complete information on a patient's medication at interfaces of care *(76)*. Involvement of pharmacists in medicines reconciliation is effective, economically viable and reduces discrepancies after discharge *(116)*.

- **Multicomponent interventions based on education of staff and guidelines:** shown to be effective at achieving almost four times more de-prescribing of inappropriate medications by the time of discharge of patient from the hospital *(117)*.

- **Information technology intervention:** computerized clinical records applied with feedback, educational outreach and dedicated support was effective in reducing various medication errors *(118)*.

The three WHO technical reports on medication safety in high-risk situations *(64)*, polypharmacy *(59)* and transitions of care *(75)* elaborate on the strategies to prevent medication errors in these key areas.

4.4   The four domains of the strategic framework

The strategic framework proposed in the WHO Global Patient Safety Challenge: *Medication Without Harm* identifies four domains and 16 subdomains to address medication safety (Fig. 3). The interventions that can be taken under each of the domains are discussed below.

4.4.1 Patients and the public

In modern health care systems, the patient's role has evolved from being a passive recipient of medical care to active, empowered, informed "producers" of health *(119)*. Involving patients in the design and delivery of a programme helps to ensure effective implementation and sustainability of measures to address medication safety. Countries and institutions can involve patients on the following subdomains:

- **Public awareness and medication literacy:** make use of the WHO materials such as "KNOW. CHECK. ASK" campaign *(120)* to improve medication literacy. Among consumers, there is a widespread misconception that T&CM products are 'natural' and hence 'safe' and carry no risk. However, incorrect, and inappropriate usage of T&CM products can also lead to unwanted effects and public should be made aware of this.

- **Patient engagement:** engage patients and providers to improve service delivery and governance *(124)*. The WHO patient engagement tool, "*5 Moments for Medication Safety*" on questions patients should ask on starting, taking, adding, reviewing and stopping a medication can be used *(121)*. There are other patient engagement tools for medication safety, available in countries and organizations *(122-123)*. Patient-held medication lists or records, sometimes called "medication passports" (paper or electronic), can help to optimize patients' medicines *(125)*. These tools are received positively by patients *(126)*. Updated medication lists, can also be helpful at care transitions *(127)*.

- **Reporting by patients:** empower patients and pharmacovigilance systems by allowing patients to report any concerns about their medications *(102)*.

- **Involvement of patient organizations:** engage with patients' organizations to provide patients' perspectives on improving medication safety .

Fig. 5. The 5 moments of medication safety

Starting a medication
- What is the name of this medication and what is it for?
- What are the risks and possible side-effects?
- Is there another way of treating my condition?
- Have I tod my health professional about my allergies and other health conditions?
- How should I store this medication?

Taking my medication
- When should I take this medication and how much should I take each time?
- How should I take the medication?
- Is there anything related to food and drink that I should know while taking this medication?
- What should I do if I miss a dose of this medication?
- What should I do if I have side-effects?

Adding a medication
- Do I really need any other medication?
- Have I told my health professional about the medications I am already taking?
- Can this medication interact with my other medications?
- What should I do if I suspect an interaction?
- Will I be able to manage multiple medications correctly?

Reviewing my medications
- Do I keep a list of all my medications?
- How long should I take each medication?
- Am I taking any medications I no longer need?
- Does a health professional check my medications regularly?
- How often should my medications be reviewed?

Stopping my medication
- When should I stop each medication?
- Should any of my medications not be stopped suddenly?
- What should I do if I run out of medication?
- If I have to stop my medication due to an unwanted effect, where shold I report this?
- What should I do with leftover or expired mediations?

Source: World Health Organization

4.4.2 Health and care workers

Health and care workers have a key role to play in ensuring medication safety. Health care leaders should raise awareness about medication safety and prioritize areas to be addressed based on an assessment of a country or institution. The subdomains to be addressed are as follows:

▶ **Education and training:** use the *WHO Curriculum Guide on Patient Safety (128)*, section on medication safety, to develop and update the skills of all categories of health and care workers in safe medication practices, and to mentor new team members on safe medication systems and practice. Training of specialists in the field of clinical pharmacology will enable training of health and care workers on activities pertaining to medication safety *(129)*.

▶ **Communication and teamwork:** provide clear and full information on medicines to all members of the clinical team throughout the process of care to prevent medication errors. Read back during verbal orders to ensure that the correct order is communicated to prevent errors.

▶ **Capability at points of care:** prescribe rationally and transcribe, dispense, administer and monitor medicines carefully using methods such as technology, legible writing, avoiding error prone abbreviations and checking on 5 rights (right patient, drug, dose, route and time). Health and care workers need to be aware of situations in which the risk of medication error is higher and ensure that safety measures are followed.

▶ **Incident reporting and learning:** report all medication errors noted and share lessons learnt following any error with the healthcare team and with patients, when possible, to prevent such errors.

Medicine being dispensed at a pharmacy, photo credit: WHO/Atul Loke

4.4.3 Medicines as products

Attention to some aspects of medicines as products can minimize errors at all stages of their use, particularly on the following subdomains:

◗ **Product quality and safety:** implement robust regulatory systems and processes to ensure that procured medicines are safe. The WHO prequalification programme for pharmaceuticals can help LMICs to obtain quality-assured pharmaceuticals *(130, 131)*. A well-functioning regulatory system and robust regulatory processes are necessary to address the issue of substandard and falsified medicines. Education and awareness-raising are first steps in preventing the use of substandard and falsified medicines *(132)*. Quality control of T&CM products also need to be ensured for safety.

◗ **Naming, labelling and packaging:** consider clarity in labelling, packaging and availability of patient information during registration of pharmaceuticals. Label high-alert medicines and LASA medicines for clear identification using 'tall man' lettering and auxiliary labelling. Indicate the names of medicinal plants included in T&CM products for correct identification.

◗ **Logistics, storage and disposal:** store the medicines according to the manufacturer's instructions and maintain the cold chain specific to each product. Store high-alert and LASA medicines separately to prevent errors. Dispose medicines according to the guidelines.

◗ **The right products at points of care:** make available appropriate medicinal products at the point of care for patients and select medicines rationally according to clinical guidelines. Develop and have an updated Essential Medicines List for the country and the WHO model lists of essential medicines can be used for this purpose *(133)*. Prescribe appropriately in the context of multi-morbidity and ageing. Empower patients so that patients can participate in decision-making to receive the medicines they would be happy to use *(134)*.

Medicines in a pharmacy, photo credit: WHO/Yoshi Shimizu

4.4.4 Systems and practices of medication

A systems approach is recommended to address errors that might arise due to unsafe working conditions, with strategies for the entire health care system, especially on the following subdomains:

◗ **Leadership and governance:** review health care systems in countries to identify areas for improving medication safety; design and implement medication safety action plans with stakeholders, involve patients and the public; and establish medication safety committees and appoint medication safety or patient safety officers.

◗ **Prescribing, preparation and dispensing:** use electronic prescribing and automated dispending where feasible. Electronic prescribing reduces the risk of medication errors due to poor legibility and ADEs *(135, 136)*, although this may not be possible in some clinical and geographical settings such as LMICs. Bar-coding improves patient safety in hospitals at a relatively low cost per avoided

error *(137–139)*. Train staff on use of technology such as automated dispensing, to reduce dispensing error rates *(27)*. Medication reconciliation and review, pharmacist involvement in medication safety, are effective in reducing medication errors in acute care (140).

- **Administration and patient monitoring:** implement strategies specific for each setting and category, prioritizing high alert medicines, perioperative care, emergency departments, care of children and the elderly to prevent administration and monitoring errors *(141, 142)*. Medication error analysis, computerized provider-order entry systems, employing emergency clinical pharmacists, independent double checking and proactive monitoring are also useful *(141)*.

- **Monitoring and evaluation:** adopt change management strategies to ensure monitoring and evaluation of progress in medication safety programmes. Implement medication error monitoring systems to determine the impact of interventions *(143)*.

A patient is taking medicines, photo credit: WHO/Sergey Volkov

5 Summary of the evidence, facts and findings

Unsafe medication practices and medication errors are a leading cause of injury and avoidable harm in health care systems throughout the world. Severe harm due to medication errors not only affect the lives of patients and their families but also those of health and care workers. Medication-related harm accounted for nearly half of all preventable harm in medical care. About one in 20 patients experience preventable medication related harm in medical care, and about a quarter of this harm is considered severe or life-threatening. Globally, if medication errors are prevented, 0.7% of global health expenditure or a loss of $42 billion USD can be avoided every year. Patients in LMICs lose twice as many disability-adjusted life years due to medication-related harm as those in high-income countries.

The highest prevalence rate of preventable medication harm is seen in elderly care units, often in patients with high rates of comorbid conditions and thus on polypharmacy. The prevalence is also high in acute specialized care settings, such as intensive care units, and associated with surgery. Medication errors occur throughout the medication use process and the prescribing and monitoring stages of medication use were the main sources of preventable harm. Medication errors occur in the context of weak medication systems and/or human factors such as fatigue, poor environmental conditions or staff shortages, which may result in severe harm, disability and even death.

Many interventions have been developed to address the frequency and impact of medication errors, but their implementation varies. Adoption of electronic health records and electronic prescribing has helped avert preventable harm at the prescribing and transcribing stages, and pharmacist-led medication reconciliation has helped to reduce errors at transitions of care. Wide mobilization of stakeholders for sustained action is required to prevent medication errors.

WHO launched the third Global Patient Safety Challenge: *Medication Without Harm* to address patient harm due to medicines, which proposes a strategic framework and key interventions. Priorities for action are high-risk situations, polypharmacy and transitions of care. Four domains have been identified for targeted action: patients and the public, health and care workers, medicines as products, and systems and practices of medication.

WHO selected 'Medication Without Harm' as the theme of World Patient Safety Day 2022 to consolidate the work on the *Challenge* and to strengthen and implement the proposed actions. The goal is to achieve widespread engagement and commitment of WHO Member States and professional bodies for action to reduce the harm associated with medicines. This policy brief identifies the key problem areas and proposes several solutions within the strategic framework to improve medication safety globally. Countries could consider the options outlined above to reduce avoidable harm due to medicines. Prioritization of the three key action areas and implementation of interventions in each of the four domains of the strategic framework, that are relevant for the country or institution, would contribute significantly in reducing medication-related harm. Countries need to also consider how they will monitor and evaluate progress effectively. The box below is a pledge that countries are requested sign listing the elements that could be considered to address medication safety.

6

A pledge to sign

Countries are asked to **sign a pledge** (Annex 2) to support the Challenge and to encourage as many of their health care facilities as possible to also pledge adoption of the Challenge. A five-point plan has been developed to facilitate adoption:

1. Designate a national coordinator of the WHO Global Patient Safety Challenge: *Medication Without Harm*

2. Take early action to protect patients from harm arising from high-risk situations, polypharmacy and transitions of care.

3. Convene national experts, health system leaders and practitioners to develop guidance and action plans for each of the four domains of the strategic framework:

   ◗ patients and the public

   ◗ health and care workers

   ◗ medicines as products

   ◗ systems and practices.

4. Establish mechanisms, including tools and technologies, to enhance patient awareness and knowledge about medicines and medication use process, and their role in managing their own medications safely.

5. Assess progress regularly.

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Annexes

Annex 1: Glossary

Term	Definition and source
Adverse drug event	Any injury resulting from medical interventions with a drug, including both adverse drug reactions in which no error occurred and complications resulting from medication errors *(1)*
Adverse drug reaction	A response to a drug that is noxious and unintended and that occurs at doses used in humans for prophylaxis, diagnosis or therapy of diseases or to modify physiological function *(2)*. These are often classified as Type A or Type B *(3)*:
	Type A adverse drug reaction: An augmented pharmacologically predictable reaction that is dose dependent; generally associated with high morbidity and low mortality *(4)*
	Type B adverse drug reaction: A bizarre reaction that is unpredictable pharmacologically and is independent of dose; generally associated with low morbidity and high mortality *(4)*
Anaphylaxis	A severe, life-threatening systemic hypersensitivity reaction characterized by rapid onset with potentially life-threatening effects on the airway, breathing or circulatory system; usually, although not always, associated with skin and mucosal changes *(5)*
Best possible medication history	A medication history obtained by a clinician that includes a thorough history of all regular medication use (prescribed and non-prescribed) from a number of sources of information *(6)*
De-prescribing	Tapering off, stopping, discontinuing or withdrawing drugs in order to manage polypharmacy and improve outcomes *(7)*
Essential medicine	Essential medicines are those that satisfy the priority health care needs of the population *(8)*
Forcing function	An aspect of design that prevents the user from acting without consciously considering information relevant to the action; forces conscious attention ("bringing to consciousness") and thus deliberately disrupts efficient or automatized performance of a task *(9)*
Formulary	A list of medicines, usually by their generic names, and indications for their use. A formulary is intended to include a sufficient range of medicines to enable medical practitioners, dentists and, as appropriate, other practitioners to prescribe all medically appropriate treatment for all reasonably common illnesses *(10)*.
High-risk (high-alert) medications	Drugs that heighten the risk of significant patient harm when they are used erroneously. Although mistakes may or may not be more common with these medications, the consequences of an error are clearly more devastating to patients *(11)*.
Medication adherence	The degree to which use of a medication by a patient corresponds to the prescribed regimen *(12)*

Term	Definition and source
Medication discrepancy	Any difference between medication use history and admission medication orders *(13)*; may be intentional, undocumented intentional or unintentional *(6)*
Medication error	Any preventable event that causes or leads to inappropriate medication use or patient harm while the medication is under the control of a health care 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 *(14)*
Medication reconciliation	Formal process in which health care professionals form partnerships with patients to ensure accurate, complete medication information transfer at interfaces of care *(6)*
Medication-related harm	Patient harm related to medication, including preventable adverse drug events (e.g., due to a medication error or accidental or intentional misuse) and nonpreventable adverse drug events (e.g., an adverse drug reaction)
Medication review	A structured evaluation of a patient's medicines with the aim of optimizing their use and improving health outcomes; entails detecting drug-related problems and recommending interventions *(15)*
Medication safety	Absence of accidental injury during the course of medication use; activities to avoid, prevent or correct adverse drug events that may result from use of medications *(16)*
Medication use process	The multistep process of use of medications by or for patients, including prescribing, ordering, storage, dispensing, preparing, administering and/or monitoring
Medicines optimization	Ensuring that the right patient receives the right medicine at the right time by focusing on patients and their experiences, to help patients to (a) improve their outcomes, (b) take their medicines correctly, (c) avoid taking unnecessary medicines, (d) reduce wastage of medicines and (e) improve the safety of medicines *(17)*
Multimorbidity	The presence of two or more long-term health conditions, which may include (a) defined physical and mental health conditions such as diabetes and schizophrenia; (b) ongoing conditions such as learning disability; (c) symptom complexes such as frailty or chronic pain; (d) sensory impairment such as sight or hearing loss; and (e) alcohol or substance misuse *(18)*
Near miss	An incident that did not affect the patient *(19)*
Patient safety	The absence of preventable harm to a patient and reduction of risk of unnecessary harm associated with health care to an acceptable minimum. An acceptable minimum refers to the collective notions of given current knowledge, resources available and the context in which care was delivered weighed against the risk of non-treatment or other treatment *(20)*
Pharmacovigilance	Science and activities for the detection, assessment, understanding and prevention of adverse effects or any other drug-related problem *(2)*
Polypharmacy	Concurrent use of several medications, often defined as routine use of five or more medications *(21)*, including over-the-counter, prescription and/or traditional and complementary medicines
Potentially inappropriate medication	Medications that are ineffective or have a high risk–benefit ratio for a particular individual or group of individuals *(22)*
Safety	Reduction of the risk of unnecessary harm to an acceptable minimum *(19)*
Side-effect	A known effect, other than that primarily intended, related to the pharmacological properties of a medication *(19)*
Transitions of care	The various points where a patient moves to, or returns from, a particular physical location or makes contact with a health care professional for the purposes of receiving health care *(23)*

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Annex 2: Pledge to support implementation of the third WHO Global Patient Safety Challenge: *Medication Without Harm*

Unsafe medication practices and medication errors are a leading cause of injury and avoidable harm in health care systems across the world. WHO launched the third WHO Global Patient Safety Challenge: *Medication Without Harm* to focus on strengthening systems to improve medication safety by reducing medication errors and avoidable medication-related harm. The goal is reducing the rate of severe, avoidable harm related to medicines globally.

More information is available at https://www.who.int/initiatives/medication-without-harm

I, _____ [INSERT NAME TITLE/DESIGNATION], on behalf of _____

[ORGANIZATION and COUNTRY], _____

hereby pledge to support implementation of the WHO Global Patient Safety Challenge, to protect patients from medication-related harm and make health care safer, through:

1. developing a plan on how our organization can support WHO Global Patient Safety Challenge: *Medication Without Harm*, after assessment of our current work;

2. identifying ways to support and implement an action plan on the three flagship areas: high-risk situations, polypharmacy and transitions of care;

3. engaging with key stakeholders at national and global levels to prioritize medication safety;

4. promoting active participation of patients and families through education and engagement for safe medication use;

5. raising awareness of the public and/or the health workforce on medication safety through campaigns and education;

6. supporting a culture of safety that encourages transparency, non-punitive action and learning from errors; and

7. sharing best practices and progress with WHO and key stakeholders.

_____   _____
                    [SIGNATURE]   [DATE AND PLACE]

E-mail address: _____