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Medication Errors: Understanding the Types, Causes, and Prevention, and the Critical Role of Pharmacists

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ABSTRACT
Medication errors are a major public health concern that can result in significant harm to patients. Understanding the different types and causes of medication errors is essential to preventing these incidents.This article reviews the literature on medication errors, their types, causes, and prevention strategies. The review includes studies from various countries and healthcare settings.Medication errors can occur at any stage of the medication use process, from prescription to administration and monitoring. Prescription errors, dispensing errors, administration errors, and monitoring errors are the most common types of medication errors. Factors contributing to medication errors include patient-related factors, healthcare provider-related factors, and system-related factors. Clinical pharmacy services have been shown to be effective in preventing medication errors.Medication errors are a preventable cause of harm to patients. Understanding the different types and causes of medication errors is crucial to developing effective prevention strategies. Clinical pharmacy services can play an important role in reducing medication errors and improving patient safety.

Keywords: medication errors,prevention, pharmacist, medication safety, patient safety, pharmacy practise, healthcare

Key Points

1. Medication errors pose a significant risk to patient health: Medication errors are a pressing public health concern that can lead to severe harm or even death for patients. These errors can occur at any stage of the medication use process, from prescribing to administration and monitoring. It is crucial to address this issue to ensure patient safety and well-being.
2. Various types and causes of medication errors: Medication errors encompass a range of types, including prescription errors, dispensing errors, administration errors, and monitoring errors. These errors can stem from different causes, such as patient-related factors (e.g., lack of understanding or communication issues), healthcare provider-related factors (e.g., fatigue or inadequate training), and system-related factors (e.g., flawed processes or technology issues).
3. Importance of prevention strategies and clinical pharmacy services: Understanding the different types and causes of medication errors is vital for developing effective prevention strategies. Clinical pharmacy services have been shown to be effective in reducing medication errors and improving patient safety. By leveraging the expertise of clinical pharmacists, healthcare systems can implement measures to prevent medication errors, such as medication reconciliation, medication education, and medication therapy management, among others.

I. INTRODUCTION:

In the 1930s, the first ICU was established. Around the same time, Harvey AK Whitney started to organise conferences and patient care rounds for trainees in clinical pharmacy practise (who were not known as pharmacy residents). In the 1950s and 1960s, when the first decentralised pharmacy services were introduced, advancements in mechanical ventilators caused a rise in the number of intensive care units (ICUs). By the 1980s, critical care pharmacy practise had spread considerably; the first critical care column had been published in a pharmacy journal; and the Society of Critical Care Medicine (SCCM) had created a section for clinical pharmacists and pharmacologists in order to acknowledge the efforts of pharmacists [1]. The rules of the Society of Critical Care Medicine (SCCM) recognise critical care pharmacists as important team members for providing care for critically ill patients [2]. These recommendations advise all hospitals delivering critical care services to have a pharmacist review drug regimens for dose, adverse reactions, drug-drug interactions, and cost management [3]. A small number of critical care professionals who were also part of cardiac arrest

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teams, surgical or trauma services, or both were available in the early 1970s. Pharmacy services were added to several ICU settings (both adult and paediatric), the operating room, and the emergency room throughout the course of the following ten years [3]. The idea of including a clinical pharmacist in a multidisciplinary team led by an intensivist developed in the United States at the beginning of the 1980s [4]. In the 1980s, critical care pharmacists began to specialise in their training and take on more leadership roles in critical care organisations. When a clinical pharmacist is included in an intensive care healthcare team, several prospective, controlled trials show a much-reduced incidence of ADEs and fewer days of hospitalisation [4]. Data in the past showed that pharmacist engagement enhanced fluid management, reduced prescription errors, and decreased the occurrence of adverse drug reactions (ADRs). Over the past 25 years, the specialty of critical care pharmacy practise has developed into a vital part of the multidisciplinary team in the intensive care unit (ICU) [3]. There is evidence that critical care pharmacist efforts have a significant influence on outcomes and can prevent potentially life-threatening situations. Future pharmacist goods and services may involve better patient and family communication, involvement in care transitions, driving quality indicator improvement, optimising dosage in specialist populations, and utilising independent prescription abilities [2]. Pharmacists developed clinical procedures in these settings that included therapeutic drug monitoring, dietary assistance, and involvement in patient care rounds. Along with the formation of critical care pharmacy satellites and other new programmes, clinical pharmacists also established safe and effective drug delivery systems [3]. A critical care pharmacist handles adverse drug events (ADEs) caused by prescription mistakes and drug-related issues. The abilities of a clinical pharmacist are described as those of responsible carers, educators, researchers, and managers in the recent intensive care unit (ICU). It enhances prescription quality, appropriateness, and patient safety. Clinical pharmacists are crucial for enhancing patient outcomes, reducing expenses, and delivering high-quality care to critically ill patients [4]. The SCCM released practise model guidelines in 2001 that focused on the provision of critical care and the responsibilities of various ICU team members [5].

Search Strategy

We carried out a search including keywords like "pharmacy," "medication management," "clinical pharmacy," "healthcare," "treatment outcomes," and "systematic review" on different databases, including PubMed and Google Scholar. in English Language

Main Text

What is a medication error?

As defined by the United States National Coordinating Council for Medication Error Reporting and Prevention, the term "medication error" refers to any avoidable incident that could cause or result in improper use of medication or harm to the patient while the medication is under the control of healthcare professionals, patients, or consumers. These incidents can be linked to professional practise, healthcare products, processes, and systems, including prescription writing, communication of medication orders, labelling and packaging of products, medication preparation, distribution, administration, education, monitoring, and utilisation [6]. It is estimated that in wealthy nations, 10% of patients experience harm during their hospital stay. Adverse events are responsible for this harm, and almost half of these incidents are avoidable. Around the world, up to 40% of patients experience harm in primary and outpatient healthcare. Preventable harm accounts for as much as 80% of this figure. The most harmful mistakes are associated with the diagnosis, prescription, and administration of medications [7]. Adverse events account for 15% of total hospital activity and expenses in OECD countries [8].

Types of medication errors

1. Prescription error:

Prescription error can be defined as a set of planned acts that may not produce the expected result, according to theories of human error, because actions did not go as planned or because the plan was insufficient [9]. The prescribing error is a common drug error that can be prevented in hospitals around the world [10]. The types of prescription errors are route, dose, frequency, dosage form, quantity to supply, omission errors related to the prescriber (including patient name, age, prescriber name, prescriber signature, patient visited department, and diagnosis), and commission errors (including wrong strength, incorrect drug name, incorrect dosage form, and drug-drug interaction) [11]. It can also be classified based on

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the potential impacts and discomfort to patients, pharmacists, and healthcare providers. It was developed as a result of three separate studies of prescription errors. There are mainly four types of prescription errors that occur: type A (potentially detrimental to the patient); type B (severe annoyance—need to contact pharmacist or doctor); type C (minor nuisance—pharmacist must use professional discretion); type D (trivial) [12].

2. Dispensing error:

Dispensing errors are any inconsistencies between the written instructions on the prescription order form and their fulfilment by the pharmacy when the medication is given to patients or hospital staff. Hospital units use a variety of medicine dispensing systems, each of which has a unique expectation of errors [13]. Missing doses, item omissions, inaccurate patient and medicine names, as well as incorrect patient names, are some of the most frequently seen dispensing errors. Some chemists may have neglected to ask patients for identification forms before dispensing, which is one of the potential reasons for dispensing errors. Occasionally, incorrect patient names, name spellings, and personal information were entered into the pharmacy database. On subsequent trips, this inaccurate information would be used, potentially resulting in dispensing errors. Missing doses, elimination of substances, and entering the wrong patient's name or medicine name are just a few of the mistakes that might result in a dispensing error. Heavy workloads, diversions, failure to double-check patient information, and uncomfortable working conditions are just a few of the variables that contributed to these dispensing failures [14].

3. Administration error:

Medication error is defined as "a medication error that occurs when a patient receives a medication that is different from what the prescriber intended. This can happen at any stage of the medication process, from prescribing to dispensing to administration. Medication errors can have serious consequences, including patient harm, increased length of stay in the hospital, and even death" [15]. Errors in drug administration frequently entail omissions, where the medication is not provided for a number of reasons. Other drug administration mistakes include using the wrong technique and administering the wrong or expired medicines. The failure to confirm the patient's identity before administering the medication and the incorrect storage of similar preparations in similar locations are two variables that contribute to medication administration errors. These errors may also be caused by environmental elements, including noise, interruptions during the medical round, and inadequate illumination [16].

4. Monitoring error:

Medication errors require particular monitoring because they pose risks that are typically preventable [17]. A monitoring error occurs when a prescribed medicine is not monitored according to the accepted standard of care in routine general practise. This includes not performing tests at the required frequency with a tolerance of 50%. However, if a patient refuses to give consent for a test, then this would not constitute an error [18].

Causes of medication errors

Various studies have investigated the factors linked to medication errors. For example, the Commonwealth Fund International Health Policy Survey found that 11% of patients who experienced medication errors were at risk due to factors such as inadequate coordination of care, obstacles to accessing medical services or medicines due to cost, the presence of multiple health conditions, and hospitalisation[19]. Several studies have indicated that medication errors are linked to a higher number of prescribed medications, as well as to patients at either end of the age spectrum: children and older adults. In addition, certain medications and those prescribed for particular health conditions, such as musculoskeletal disorders, oncology and immunosuppression, dermatology, ophthalmology, otolaryngologic conditions, infections, and cardiovascular conditions, have also been associated with a higher risk of medication errors [20, 21–22].

Table 1: Different factors leading to medication errors [23]

The factors that are linked to healthcare professionals are:
Insufficient training in therapy.
Lack of experience and knowledge of drugs.
Limited knowledge of the patient.
Insufficient risk perception.

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Overworked or fatigued professionals.
Physical and emotional health problems
Ineffective communication within and between healthcare providers and patients
Factors related to patients
Patient characteristics.
Complexity of the clinical case.
Factors linked with medications:
The naming of medicines
The labelling and packaging of medications
Factors related to the work environment include:
High workload and time constraints.
Disturbances and disruptions from both primary care staff and patients.
Inadequate standardisation of protocols and procedures.
Limited availability of resources.
Problems with the physical work environment, such as lighting, temperature, and ventilation.
Factors related to tasks
Patient monitoring may vary depending on the specific practise, patient, other healthcare settings, and prescriber.
use of standardised and repeatable procedures for tasks such as ordering, processing, and authorising medications or treatments.
Factors linked to computerised information systems
Complicated procedures for creating initial prescriptions, such as confusing drug selection lists, preset dosage regimens, and missed notifications.
Challenging procedures for producing accurate refill prescriptions.
absence of precision or correctness in the patient's medical records
A design that is not adequate enough to prevent human errors.
Factors related to the work environment include
High workload and time constraints
Limited availability of resources
Inadequate standardisation of protocols and procedures
Disturbances and disruptions from both primary care staff and patients
Problems with the physical work environment, such as lighting, temperature, and ventilation.
Interface between primary and secondary healthcare services.
Poor communication between primary and secondary care
Insufficient explanation or reasoning behind recommendations from secondary care.

Clinical Pharmacy Services

Clinical pharmacy services have become integral to ensuring patient safety in hospitals and have undergone significant developments over the last few decades. Initially, these services involved pharmacists participating in ward rounds or conducting chart reviews in clinical settings. However, the role of pharmacists in clinical practise has evolved to include clinical specialisation, management of outpatient clinics, and prescribing within their areas of expertise in some countries. These advances have contributed to raising the profile and recognition of clinical pharmacists globally. Nevertheless, significant variations persist in the provision of clinical pharmacy services both within and across different countries [24].

According to a survey conducted in Germany, pharmacists carry out a wide range of services, with pharmacy consultations and training for nursing and medical staff being the most common. In cases where services are already established, the primary focus is on admission and providing support throughout the patient's hospital stay. Medicine management is a major area of focus, with pharmacy departments providing medication reviews, participating in ward rounds, and offering comprehensive medication reconciliation on admission [24].

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Table 2: CLASSIFICATION OF THE PIs (pharmaceutical interventions) ACCORDING TO CARDINAL AND FERNANDES [25, 26].

A	Interventions that pertain to the appropriate use, inappropriate use, and effectiveness of treatments
B	Treatment regimen: interventions that involve prescribing drugs, determining the appropriate dosage, frequency, and route of administration, specifying the duration of treatment, and addressing cases of duplicate prescriptions
C	Pharmacokinetics: Interventions focused on understanding and managing how drugs are absorbed, distributed, metabolized, and excreted by the body, as well as monitoring serum levels of drugs and electrolytes.
D	Drug interactions: interventions that involve managing interactions between drugs as well as interactions between drugs and nutrients
E	Adverse drug events: Interventions focused on preventing adverse drug events, such as prescribing drugs that the patient has not had a prior adverse reaction to,
F	Injectable drugs: technical interventions that involve the administration of injectable drugs, including managing the route of administration, reconstitution and dilution of drugs, ensuring drug stability, specifying the time of administration, considering photosensitivity, and assessing compatibility with re-constituents, solvents, pharmaceuticals, and PVC.
G	Administration of drugs via feeding tube: interventions aimed at addressing issues with the improper administration of drugs through feeding tubes, which may include failure to follow institutional protocols and inadequate administration techniques
H	Interventions focused on modifying the pharmaceutical protocol to facilitate drug administration via feeding tube or changing the route of administration if necessary: Interventions that address the prescription of drugs that are not suitable for administration through feeding tubes: Recommending changes to the pharmaceutical protocol or alternative routes of administration.
I	Toxicity: Interventions aimed at managing cases of overdose, excessive dosing, drug intoxication, and poisoning caused by pharmaceuticals and administering appropriate antidotes
J	Non-standard drugs: Interventions focused on recommending the replacement of non-standard drugs with standard drugs that are available within the institution.
K	Education for patients and carers: interventions that involve obtaining a complete pharmaceutical history and providing discharge instructions to patients and/or carers These interventions also include medication reconciliation at all stages of hospitalisation, which may involve including previously used drugs, adjusting dosage, route of administration, and schedule to optimise patient care.
L	Illegibility and duplicity of prescriptions: Interventions focused on addressing issues with illegible handwriting on prescriptions and preventing the issuance of duplicate medical prescriptions.

Examples of clinical pharmacy services

Over the past few years, the role of the emergency medicine (EM) clinical pharmacist has grown to prioritise comprehensive direct patient care services. These services involve conducting patient assessments at the bedside with the EM medical team and promptly providing individualised pharmacotherapy recommendations

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based on the patient's specific disease. EM clinical pharmacists assist in medication selection, administering optimal doses, delivering drug information to patients and medical staff, conducting research and scholarly activities, as well as handling administrative and operational responsibilities to improve the delivery of care to patients in the emergency department (ED) [27].

Emergency medicine (EM) clinical pharmacists play diverse roles in practise sites of all sizes, from large academic and community centres to small and rural EDs. In 2011, an updated guideline was published to define the role of clinical pharmacists in the ED, propose institutional objectives for pharmacy services, and establish best practises [28].

Table 3: Activities of Emergency Medicine Clinical Pharmacists [Adapted from 27]

Bedside clinical activities
Emergency department resuscitation team (cardiopulmonary arrest, trauma and burn resuscitation, myocardial infarction, stroke, sepsis)
Direct bedside care during high-risk medication use (rapid sequence intubation, procedural sedation)
Pharmacotherapy consultation
Drug information
Medication selection
Medication dose (based on patient-specific factors such as age, weight, route of administration, and renal function)
Medication therapy monitoring
Drug interaction analysis
Drug identification
Drug compatibility for admixing or administration
Error and adverse event reporting
Patient counselling and education
Toxicology recommendations
Targeted disease state counselling (e.g., anticoagulation, anaphylaxis)
Antimicrobial stewardship activities include microbiological culture and susceptibility follow-up.
Prospective medication order review and verification
Assistance with medication procurement and preparation (advanced knowledge of medication storage and distribution and institutional policies and procedures)
Medication administration
Vaccine administration
Emergency preparedness
Facilitation of medication histories
Oversight of pharmacist extenders (e.g., technicians, students)
Training and education
Medication therapy updates and education on optimal medication therapy for ED team members often take place at the bedside or in the ED.
Education through conferences and pharmacology rotations for EM attendings and residents
Implementation and execution of post-graduate EM pharmacy residency training programmes
Participation in an interdisciplinary simulation
Performance improvement
Guideline/protocol/process development
Formulary management
Medication dispensing cabinet optimisation
Optimisation of medication procurement workflows
Medication safety initiatives
Participation in root cause analysis (RCA) and failure mode and effect analysis (FMEA)
Assistance with adherence to regulatory and institutional medication use policies
Scholarly activities

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Interdisciplinary EM clinical research
Identification of patients for enrollment in investigational drug studies recruiting in the ED
Participation in interdisciplinary research committees that review ED-related research protocols
EM-related research grant preparation
EM medical resident research projects or quality improvement projects
Participation in articles, book chapters, case reports, or other collaborations with EM physicians

Role of clinical pharmacists in medication error and ADR prevention.

Several studies have investigated ways to enhance prescribing quality in primary care, but outcomes vary, and few studies have specifically targeted medication errors. Addressing medication errors and promoting medication safety requires a comprehensive systems approach. This section highlights several key interventions that can aid primary care professionals in reducing medication errors and enhancing patient safety. These strategies involve utilising clinical pharmacists, computer technology, and educational programmes, frequently within multifaceted interventions. The elderly population is also prioritised. Some interventions have concentrated on specific clinical areas, such as infectious diseases and appropriate antibiotic use. It is important to note that most interventions have been carried out in individual countries and may not be generalizable to other countries with varying healthcare service structures, availability of services, or technology. Medication error is a general term that refers to a variety of more specific occurrences that may result in improper pharmaceutical use or patient damage [29]. Different types of medication errors can be seen in the prescribing pattern, administration, and dispensing of the medications [30]. On the other side, ADRs might be seen as a serious economic and public health issue [31]. The phrase "adverse drug reaction" (ADR, sometimes known as "adverse drug effect") refers to any undesirable, uncomfortable, or potentially harmful effects that pharmaceuticals (including prescriptions) may have [32]. The most common occurrences of medication errors are selection, use, and interactions. Medication errors occur in several areas; one of the most common is medical wards, and this can be prevented by the clinical pharmacist’s intervention [33]. Patient safety can be improved by identifying and minimising the main causes of medication errors (MEs) and adverse drug reactions [34]. The pharmacist has a chance to take on a larger role as a patient safety leader, collaborating with patients and other healthcare professionals to enhance patient outcomes and avoid prescription errors. The most crucial role of a pharmacist is to ensure the safety of the prescribing and dispensing of medication to patients. Moreover, another important role is to check whether the patient is getting the correct dose and medication for a particular disease [35]. Prevention of ADR and medication errors is crucial for the patient's better health and lifestyle. The most common cause of ADR includes errors in giving the wrong dose of drug at the wrong time. Additionally, the drug is contradicted or the patient is already on some medication regimen, which may cause a curtain ADR to the present prescribed drugs [36]. Pharmacists can take active part in therapeutic drug monitoring, join medical ward rounds, review patients' histories and medical records, educate health care workers about drug therapy, and also provide guidance regarding lifestyle modifications to patients. By performing the aforementioned activity by the pharmacist, the majority of medication errors and ADRs can be prevented [33].

Medication reviews and reconciliation

Medication review is a crucial process that involves the evaluation of a patient's medicines to enhance health outcomes and address drug-related issues [37]. A review of 38 primary care intervention studies aimed at minimising medication-related adverse events discovered that successful interventions often comprised medication reviews carried out by pharmacists or other clinicians or multifaceted interventions that included medication reviews conducted by primary care professionals as one component. Research findings indicated that medication reviews led by pharmacists contributed to fewer hospital admissions [38]. Medication reconciliation involves creating a comprehensive and accurate list of a patient's medications during care transitions and resolving any discrepancies. Patients with more prescribed medications have been found to have an increased risk of medication discrepancies at discharge, emphasising the importance of addressing polypharmacy as a complex issue that can threaten patient health [39].

Automated information systems

According to a review of 10 randomised trials, half of the studies showed a decrease in

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medication errors when using computerised interventions. Computerised provider order entry (CPOE) systems with clinical decision support (CDS) can be effective in reducing the number of potentially inappropriate medications, but only if the alerts are clinically relevant and the number of alerts is limited [23].

Education

As discussed in another section of this technical series, educating healthcare providers is an important factor in enhancing safety in primary care, including reducing medication errors. Education is frequently included in multifaceted interventions aimed at improving medication safety. A study of 47 articles showed that educational interventions aimed at improving antibiotic prescription and dispensing may affect clinician behaviour, resulting in improved adherence to guidelines [40].

Multicomponent interventions

A study was conducted to evaluate the progress made in improving the use of medicines in ambulatory primary care practises in 104 low- and middle-income countries. The study reviewed empirical evidence and identified 110 studies that used adequate study design to evaluate interventions aimed at improving medication use. Complex interventions that combined education, provider supervision, and community case management strategies were found to be the most effective in improving medication use [41].

Obstacles to pharmacist participation in clinical pharmacy services:

a) The lack of skills and confidence among pharmacists in providing clinical pharmacy services hinders their participation in the primary care team. Poor knowledge, expertise, and fear of being questioned result in difficulties and decreased motivation.

b) Poor communication among healthcare professionals impacts the involvement of pharmacists in clinical pharmacy services. The absence of good interactions and collaboration, as well as the belief that hospital wards are just for physicians and nurses, restricts the participation of other healthcare workers.

c) The absence of a systematic plan for on-the-job training decreases pharmacists' capacity to provide clinical pharmacy services in hospitals. The lack of training on the job, coupled with the lower priority given to clinical pharmacy services, hinders pharmacists' participation.

d) The superiority and inferiority behaviour among healthcare professionals, particularly doctors' arrogance, results in some young pharmacists and other healthcare professionals being humiliated when providing primary patient care services.

e) The shortage of pharmacists in hospitals can limit their ability to provide clinical pharmacy services. Due to this, administration may assign pharmacists to non-pharmaceutical tasks, which further hinders their involvement [42].

f) The absence of guidelines, SOPs, and monetary incentives for clinical pharmacy service provision can limit the availability of such services. Inadequate regulation from the Ministry of Health and relevant authorities further hinders pharmacist participation in primary healthcare services [42].

g) The lack of clinical training and knowledge during undergraduate pharmacy education, staff shortages, heavy workloads, and time constraints are some barriers pharmacists faces in providing clinical pharmacy services. Education and training programmes that focus on enhancing clinical knowledge, skills, and attitudes can help overcome these barriers [43]. Other studies have also highlighted the need for pharmacist training to support the implementation of CPS. [44,45,46].

Table 4: Perceived barriers to the implementation of clinical pharmacy services in public health units [adapted from [43]]

Categories	Accredited pharmacists	Non-accredited pharmacists
Local healthcare network	Health professionals' stoppages and strikes shortage of drugs and devices. Lack of adequate physical structure in some health units Unawareness of some managers regarding CPS	shortage of drugs and devices. Lack of adequate physical structure in health units Dismissals and lack of sufficient human resources Physical distance between some health units and the pharmacists' workplaces
Healthcare team	Unawareness of the healthcare	healthcare team's resistance to

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	team about the pharmacists' work.	implementing CPS.
Pharmacists	Insufficient clinical education and training during the undergraduate degree in pharmacy Difficulty in recruiting patients Difficulty understanding the implementation of CPS Lack of adaptation among the healthcare team	Difficulty in reconciling the clinical and logistic activities Gaps in pharmacist-health unit communication decline of the pharmacist and healthcare team relationship. Pharmacists' resistance to implementing the CPS Difficulty in recruiting patients
Implementation process of the CPS	inappropriate period to implement CPS. short period to implement CPS. CPS is not tailored to the health unit and patients. Poor marketing strategies Lack of prior evaluation of pharmacists' clinical competences	inappropriate period to implement the CPS.
Patients	lack of understanding about CPS.	resistance and lack of awareness among the patients regarding CPS.

Future Directions for Pharmacist Involvement in Patient Care

The health care community has traditionally viewed pharmacist interventions as a vital contribution to the process of providing patients with care by lowering pharmaceutical mistakes, rationalising therapy, and lowering therapy costs. Pharmacists now play a variety of roles, ranging from clinical practise to patient care, patient counselling, health care education, and community service [47]. After being discharged from the hospital, a chemist's intervention during the transition of care is a useful tactic for lowering drug mistakes. Pharmacists play a crucial role in the reporting process, such as giving the right feedback to providers, and have a particular skill and knowledge base that can help reduce prescription mistake rates. This might lead to better prescribing habits, more effective teamwork, and increased pharmacist self-worth among the care team [48]. A pharmacist's intervention also lowers follow-up trips to the emergency room. To increase patient safety and quality of care during transitions of care, hospitals ought to think about putting this intervention into practise. Due to their training and close interaction with patients following hospital release, chemists are in a good position to provide medication reconciliation and patient education [49]. Limitations on reimbursement and coverage of specific prescriptions can reduce drug costs without increasing demand for other health services. Increasing medication reconciliation by community pharmacists after hospital discharge can decrease adverse events, readmissions, and mortality. Pharmacists must operate within technological constraints to handle new risks to patient safety, but technological advancements have expanded their roles and improved pharmaceutical safety. Prior to nurses accessing medications, pharmacists evaluate and approve prescriptions to ensure the correct medications are given. Advancing medication stewardship, providing daily patient care, focusing on longitudinal patient care, and optimising health technology are crucial for pharmacists to provide better patient care. Multidisciplinary, team-based approaches to patient care and improvement implementation are emphasised by patient safety programmes. Pharmacists can take on a bigger role in enhancing care transitions and considering non-clinical patient characteristics, including social determinants of health, to move towards longitudinal patient care. The role of pharmacists will continue to evolve as patient safety measures prioritise medication errors and adverse drug reactions, expanding the potential for pharmacists to play a key role in reducing adverse drug reactions and improving patient safety [48].

II. CONCLUSION

In conclusion, medication errors refer to any avoidable incidents that can cause harm or improper use of medication while under the control of healthcare professionals, patients, or consumers. The most harmful medication errors are related to the diagnosis, prescription, and administration of

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medications and can be linked to professional practise, healthcare products, processes, and systems. Prescription errors, dispensing errors, administration errors, and monitoring errors are the four main types of medication errors. Medication errors can be caused by various factors, such as inadequate coordination of care, obstacles to accessing medical services, multiple health conditions, hospitalisation, and specific medications. Clinical pharmacy services have become integral to ensuring patient safety in hospitals and have undergone significant developments over the last few decades, helping to reduce medication errors and prevent harm to patients. Overall, it is crucial for healthcare professionals and consumers to be aware of medication errors, their types, causes, and prevention measures to ensure patient safety and improve the quality of care.

DECLARATIONS

i. Funding

Not applicable

ii. Conflicts of interest/Competing interests

No competing interest

iii. Ethics approval

Not applicable

iv. Consent to participate

Not applicable

v. Consent for publication

Not applicable

vi. Availability of data and material

Not applicable

vii. Code availability

Not applicable

viii. Authors' contributions

All authors have equally contributed in the article.

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