Original Article

EVALUATING THE EFFECTIVENESS OF INTERVENTIONS TO REDUCE MEDICATION ERRORS: A SYSTEMIC REVIEW

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Abstract

According to "World Health Organization" (WHO), medicines involve the 2nd highest disbursement after staff costs in a country's health care system. The statistics of worldwide spending on medicines showed that in 2010; whole spending on medicine was 887 billion U.S. dollar and it is estimated that until 2025 the pharmaceutical market will gain to around 1.8 trillion U.S. dollars. There are 2 essential components for ensure the quality use of medicines. The first is to institute standards of practice that define standard operating procedures and the second is to recognizes the positions or persons, working within the accepted limits of their roles, who are accountable for implementing each-step of the process. The organization of drug supply is organized around five primary functions of the Medicines Management cycle namely-selection, quantification,procurement, distribution, and use. Rational use of drugs involves choosing the right drug, at the right dose, for the right duration, and for the right indication in the right patient. Adverse event and adverse drug reactions (ADRs) are terms used to describe any undesirable effect of a medical treatment, including a drug, a medical device, or a procedure. ADRs are usually mild and reversible, but can also be severe or even life-threatening. By following best practices for prescribing medications, health care providers can ensure that their patients receive the best possible care. This includes educating patients about their medications and monitoring them closely for any potential side effects or adverse reactions.

KEYWORDS: Adverse Drug Reaction, Automated dispensing cabinets, Healthcare education, Medication management, Prescription error.

1. INTRODUCTION

According to the "World Health Organization" (WHO), medicines are the second most expensive expenditure in a country's health-care system, after staff costs.The statistics of worldwide spending on medicines showed that in 2010, total spending on medicine was 887 billion U.S. dollars, and it is estimated that until 2020, the pharmaceutical market will grow to around 1.8 trillion U.S. dollars. The money spent by governments on buying medicines is very large, and 40 to 60 percent of the entire public sector health budget of any country goes into purchasing medicines. Despite such massive spending, one-third of the world's population lacks access to essential medicines, which in reality goes up to one half in Asia and Africa. A leading reason for this adverse situation is the misdirection of available resources, and according to one estimate, up to 70 percent of resources are wasted in any country due to unfortunate drug management systems. The World Bank indicates that in many

developing countries, a high percentage of medicine losses occur in the government's procurement, storage, distribution, and utilisation systems. It has also been established that in certain regions, a significant equilibrium of essential medicines and supplies are misappropriated. To address this gap, prudent management of drug systems is mandatory. Therefore, rational drug management has become an increasingly essential topic in order to make optimal use of the drug budget and offer health services of the highest manageable standard. A coordinated approach that assists and improves continuity in all areas of the community and health care sector is the key to safe and appropriate medicine management.There are two essential components to ensuring the quality use of medicines. The first is to institute standards of practise that define standard operating procedures, and the second is to recognize the positions or persons, working within the accepted limits of their roles, who are accountable for implementing each step of the process.

In 2000, an expert group on learning from adverse events in the "National Health Service" **(**NHS), chaired by the "Chief Medical Officer" (CMO), reported that since 1985, there had been at least 13 episodes in which people (usually children) had been killed or paralyzed because of the wrong administration of drugs by spinal injection; 12 involved vinca alkaloids; 10 were fatal. Serious medication errors are rare, but it is salutary that it took so long to recognize that therapeutic action was needed in this case. Even so, this misconception continues to be made. [1]

2. MEDICINES MANAGEMENT CYCLE

The organization of drug supply is organized around the five primary functions of the medicine management cycle: selection, quantification, procurement, distribution, and use. At the midway point of this cycle is a centre of management support systems, which include organization, financing, sustainability, information management, human resource management, and quality assurance management. The success of the medicines management cycle will depend on the ability to reliably and consistently supply standard-quality medicines at affordable rates to health care facilities at all levels of the health care system. Pharmaceutical supply chains are different because they usually have big and extended global pipelines requiring high levels of product accessibility with high uncertainty in supply and demand. To sustain and expand the successful interventions, these supply chains must be strengthened and made more flexible through better management and increased resource investment in order to achieve supply chain optimization. Many countries do not periodically monitor their supply chain systems and report on their performance. Even if monitoring does occur, it is often based on periodic survey data for a restricted set of indicators. An appraisal of the performance of supply chains is constrained by a number of factors, including a lack of information and the presence of many confounding elements that impact medicine accessibility, in particular, financing. [2]

3. RATIONAL DRUG

Rational use of drugs involves choosing the right drug at the right dose, for the right duration, and for the right indication in the right patient. It involves considering the patient’s clinical status, risk factors, and concurrent medication when selecting a drug. In addition, it should also include educating the patient on the correct use of the drug and monitoring for potential adverse effects. Hospital Pharmacy Services are designed to meet the essential needs of all customers, and it is important to enhance the inclusion of patients in all processes involved in health care delivery. Such services include the dispensing of pharmaceutical products in accordance with country regulations, proper inventory maintenance functions, drug monitoring, patient drug assessment functions, proper record keeping, drug information, education services, and performance improvement functions. Many terms like "rational use of medicines," "responsible use of medicines," "quality use of medicines," "improved use of medicines," etc. are used to describe appropriate practices and procedures leading to the most prudent use of medicines. The World Health Organization (WHO) has been making a continuous effort to promote rational use of medicine. The ultimate goal is for patients to receive medication that is appropriate for their clinical needs, in doses that meet their own individual needs for an adequate period of time, and at the lowest possible cost. However, approximately more than 50% of all medicines are prescribed and dispensed

inappropriately, while 50% of patients fail to take them properly worldwide, and about one-third of the world's population lacks access to essential medicines. [3]

4. A MEDICATION ERROR

A medication error may be defined as "a failure in the treatment process that leads to, or has the potential to cause, harm to the patient." Medication errors may occur in selecting a medicine—irrational, inappropriate, and ineffective prescribing, including under- and over prescribing; writing the prescription—prescription errors, including illegibility; manufacturing the preparation to be used—incorrect strength, contaminants, incorrect or misleading packaging; dispensing the formulation—the incorrect drug, the incorrect formulation, the incorrect label; administering or taking the drug—the incorrect dose, the incorrect frequency, incorrect duration; monitoring therapy—failing to modify the therapy when required, erroneous alteration. The term "failure" within the definition implies that certain standards should be set, against which failure may be judged. All those people who are dealing with medicines should establish or be familiar with such standards. They must institute or observe measures to confirm that failure to satisfy the standards doesn't occur or is unlikely. Everybody involved in the treatment process is accountable for their part of the method. [4]

5. ADVERSE EVENTS AND ADVERSE DRUG REACTIONS

Adverse events and adverse drug reactions (ADRs) are terms used to describe any undesirable effect of a medical treatment, including a drug, a medical device, or a procedure. ADRs are usually mild and reversible, but they can also be severe or even life-threatening. Nausea, vomiting, dizziness, headache, fatigue, and rash are all common adverse reactions. The severity of an ADR depends on the drug dose, the individual's response, and the underlying health condition of the patient. It is important to recognize and report any adverse events or reactions to ensure proper diagnosis and treatment. Health care providers should be aware of potential ADRs and take steps to minimize their occurrence. This can include monitoring the patient's response to the treatment, adjusting the dosage, and changing the drug if necessary. Patients should also be educated about possible ADRs and their symptoms, so that they can recognize them and seek appropriate medical attention. If an adverse event occurs while an individual person is taking a drug, it may be an adverse drug reaction (ADR). The term "adverse drug event" is usually used to describe this, but it is an awful term and may be avoided. If an adverse event is not due to a drug, it remains an adverse event; if it is due to a drug, it becomes a suspected ADR. An ADR is "an appreciably harmful or unpleasant reaction, resulting from an intervention associated with the utilization of a medicinal product." Some medication errors cause ADRs, but many do not; on rare occasions, a drug error may cause an adverse event that is not an ADR (for example, when a cannula penetrates a blood vessel and causes a haematoma). [5]

6. FREQUENCY AND OUTCOMES OF MEDICATION ERROR

The precise frequencies of medication errors don't seem to be known. The strategy of detection can affect the estimated frequency. Probably most errors go unnoticed; of those that are detected a minority actually lead to ADRs, or a minimum of serious ones. For example, in a UK hospital study of 36 200 medication orders, a prescribing error was identified in 1.5% and most (54%) were related to the selection of dose; errors were potentially serious in 0.4%. During a survey of 40 000 medication errors in 173 hospital trusts in England and Wales within the 12 months to July 2006, collected by the National Patient Safety Agency, 15% caused slight harm and 5% moderate or severe harm. In a very US study, 1.7% of prescriptions dispensed from community pharmacies contained errors. Since 3 billion prescriptions are dispensed annually within the USA, 50 million would contain errors. Of those, only 0.1% were thought to be clinically important, giving an annual incidence of such errors of about 50 000. Wrong label information and directions were the foremost common types of errors.

However, it's important to detect medication errors, whether important or not, since doing so may reveal a failure within the treatment process that would on another occasion cause harm. There's also evidence that the death rate from medication errors is increasing. From 1983 to 1993 the numbers of deaths from medication errors and adverse reactions to medicines utilized in US hospitals increased from 2876 to 7391 and from 1990 to 2000 the annual number of deaths from medication errors within the UK increased from about 20 to merely under 200. These increases don't seem to be surprising—in recent years hospitals have seen increased throughput of patients, new drugs have emerged that are increasingly difficult to use safely and effectively, treatment has become more complex and specialized, and therefore the population has aged, factors that tend to extend the danger of medication errors.

When errors are detected, they will cause much dissatisfaction. According to a 2000 report citing UK medical defence organizations,1.25% of all litigation claims in normally practice were because to medication errors and involved the subsequent errors: prescribing and dispensing errors (including a wrong, contraindicated or unlicensed drug, a wrong dosage, or wrong administration); repeat prescribing without proper checks;failure to supervise progress; and failure to warn about adverse effects (which might, however, not be thought to be a medication error).[6]

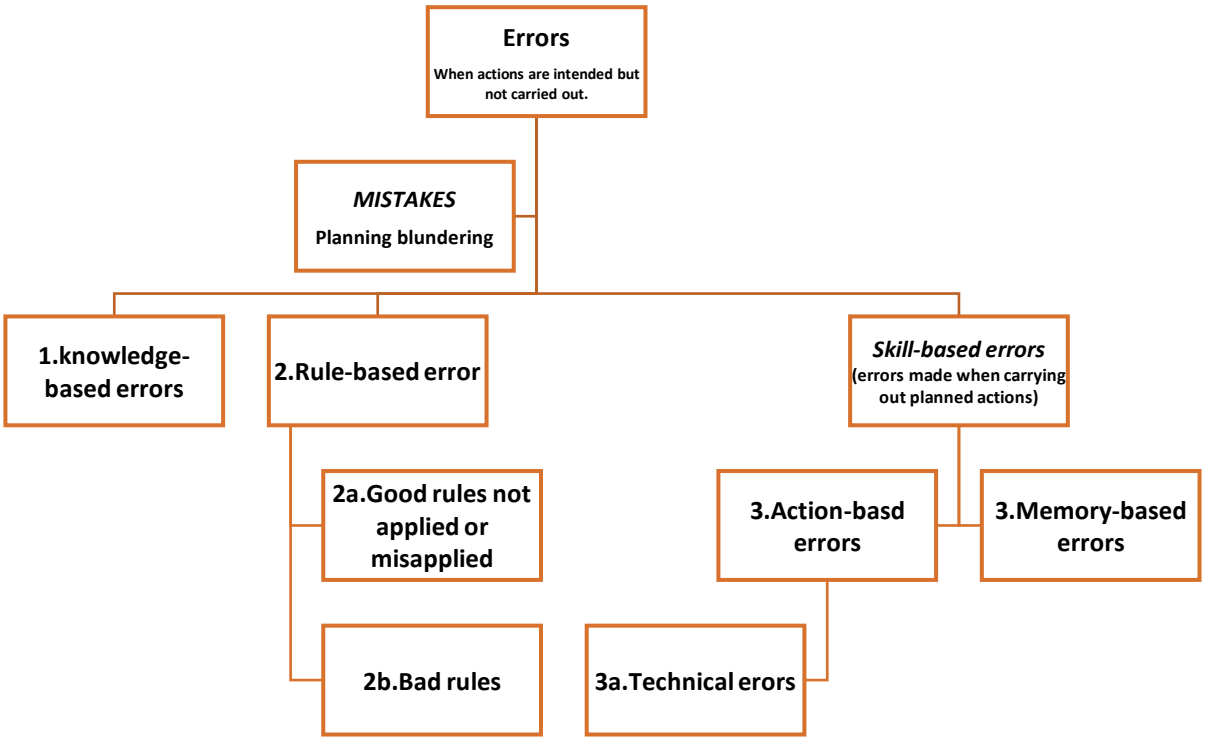
7. TYPES OF MEDICATION ERROR AND PREVENTION

The best way to understand how medication errors happen and how to avoid them is to consider their classification, which might be contextual, modal, or psychological. Contextual classification deals with the precise time, place, medicines, and other people involved. Modal classification examines the ways within which errors occur (for example, by omission and substitution). Psychological classification is to be preferred because it explains events instead of merely describing them. Its disadvantage is that it concentrates on human instead of system sources of error. The following psychological classification is based on Reason's normal work on errors.

There are four broad types of medication errors:

7.1 knowledge-based errors—for example, administering penicillin without having established whether the patient is allergic or not. In an Australian study, communication difficulties with senior staff and difficulty accessing proper drug-dosing information contributed to knowledge-based prescription errors. These types of errors should be avoidable by being well informed about the drug being prescribed and therefore the patient to whom it's being given. Computerized prescribing systems, bar-coded medication systems, and cross-checking by others (for example, clinical pharmacists and nurses) can help to intercept such mistakes. Education is essential.[7]

Figure no 1: Reason For medication error



7.2 Rule-based errors—for example, injecting diclofenac into the lateral thigh instead of the buttock. Proper rules and education help to avoid these forms of error, as do computerized prescribing systems. Action-based errors (called slips)—for example, picking up a bottle containing diazepam from the pharmacy shelf when aspiring to take one containing diltiazem Within the Australian study mentioned above, most errors were due to slips in attention that occurred during routine prescribing, dispensing, or drug administration. These may be minimized by creating conditions in which they are unlikely (for example, by avoiding distractions, by cross-checking, by labelling medicines clearly, and by using identifiers like bar codes); so-called "Tall Man" lettering (mixing upper- and lower-case letters within the same word) has been proposed as a way to avoid misreading labels, but this method has not been tested in real-world conditions. The technical error is a subset of action-based errors, such as putting the wrong amount of potassium chloride (KCL) into an infusion bottle.This kind of error may be prevented by the use of checklists, fail-safe systems, and computerized reminders.

7.3 Memory-based errors- such as administering penicillin despite knowing the patient is allergic but forgetting These are hard to avoid; they may be intercepted by computerized prescribing systems and by cross-checking. [8]

Table no 1 : Examples of prescribing faults and prescription errors

Type of error	**Example**	**Outcome**
Knowledge based	Being unaware of the interaction between warfarin and erythromycin	Warfarin toxicity
Rule based	Prescribing oral treatment in a patient with dysphagia	Lung aspiration or failure to treat

Action based	Being distracted, writing diazepam for diltiazem	Sedation
Technical	Writing illegibly, so that 'Panadol' (paracetamol) is dispensed instead of 'Priadel' (lithium)	Loss of effect
Memory based	Forgetting to specify a maximum daily dose for an 'as required' drug	Poisoning or unnecessary treatment

7.4 latent factors- Mistakes (knowledge- and rule-based errors), slips (action-based errors), and lapses (memory-based errors) are called "active failures." However, there are several properties of systems (so-called "latent factors") that make prescribers sensitive to error. As an example, working overtime with inadequate resources, poor support, and low job security all contributed to an increased risk of medication errors by nurses. Among doctors, depression and exhaustion are also important. Errors are more likely to occur when tasks are carried out after hours by busy, distracted staff, often with regard to unfamiliar patients. There's a specific risk of errors when doctors first arrive in hospitals, thanks to shortcomings in their knowledge and presumably also because they're unfamiliar with local prescription charts and other systems. Improved education and improved working conditions, including better induction processes, should reduce the probability of errors that are due to these factors; a national prescription form would help. [9]

Detecting and reporting errors: One difficulty in detecting errors is that people who make them fear disciplinary procedures and don't want to report them. The establishment of a blame-free, non-punitive environment can obviate this. The reporting of errors, including near-misses, should be encouraged, with error reports used to identify areas of likely occurrence and steps within the treatment process simplified and standardized. However, some systems for voluntarily reporting medical errors are of limited usefulness because reports often lack details and there's incomplete reporting or under reporting. A medication error reporting system should be readily accessible, with clear information on the way to report a medication error, and reporting should be followed by feedback. Detection can be improved by using a collection of methods. [10]

8. PRESCRIBING FAULTS & PRESCRIBING ERROR

Errors in prescribing may be divided into irrational prescribing, inappropriate prescribing, ineffective prescribing, under prescribing and over prescribing, and errors in writing the prescription. The inadequacy of the term 'error' to explain all of those is obvious. Failing to prescribe an anticoagulant for a patient in whom it's indicated (under prescribing) or prescribing one when it's not indicated (over prescribing) are other types of error from errors that are made when writing a prescription. I therefore choose to use the terms 'prescribing faults' and 'prescription errors'. The term 'prescribing errors' ambiguously encompasses both types.

8.1 Prescribing Faults

Irrational and inappropriate prescribing - **'**Rational' is defined as 'based on, derived from, reason or reasoning' and 'appropriate' as 'specially fitted or suitable, proper'. One would expect rational prescribing to be appropriate, but that's not always the case. A rational approach may result in inappropriate prescribing, if it's based on missing or misinformation. If, as an example, one does not know that another prescriber has already prescribed paracetamol unsuccessfully for a headache, a prescription for paracetamol might be rational but inappropriate. Consider an example from my very own practice.

• A woman with having Liddle's syndrome presented with severe symptomatic hypokalaemia. Her doctor reasoned as follows:

– she has potassium depletion;

– spironolactone is a potassium-sparing drug;

– spironolactone will cause her to retain potassium;

– her serum potassium concentration will normalize. She took a full dose of spironolactone for several days, supported this logical reasoning, but still had severe hypokalaemia. Her doctor should have reasoned as follows: she has potassium depletion because of Liddle's syndrome, a channelopathy that affects epithelial sodium channels; there's a choice of potassium-sparing drugs; spironolactone works via aldosterone receptors, amiloride and triamterene via sodium channels; in Liddle's syndrome an action via sodium channels is mandatory. When she was given amiloride rather than spironolactone her serum potassium concentration rapidly rose to within the reference range.[11]

Ineffective prescribing -Ineffective prescribing is prescribing a drug that's not effective for the indication normally or for the particular patient; it's distinct from under prescribing. In a study of 212 patients, 6% of 1621 medications were rated as ineffective. Of 196 US out-patients aged 65 and older who were taking five or more medications, 112 (57%) were taking a medicine that was ineffective, not indicated, or duplicative. And during a Scottish study, 49% of general practices prescribed homeopathic remedies, 5% of practices accounting for 50% of the remedies prescribed.

One would expect ineffective prescribing to be minimized by the utilization of guidelines, but there's conflicting evidence; prescribing guidelines is also ineffective unless accompanied by education or financial incentives.

Under prescribing- Under prescribing is failure to prescribe a drug that's indicated and appropriate, or the utilization of too low a dose of an appropriate drug. The true extent of under prescribing isn't known, but there's evidence of serious under prescribing of some effective treatments, like angiotensin converting-enzyme inhibitors for patients with heart failure and statins for hyperlipidaemia.

The sources of under prescribing include fear of adverse effects or interactions, failure to acknowledge the appropriateness of therapy, and doubts or ignorance about likely efficacy. Cost may play an important role. There's a inclination to avoid treatment in older people, and this could result in unwanted effects, including the so-called risk-treatment mismatch, during which those that who are at greatest risk are less aggressively treated, an effect that may be partly related to age. However, other factors may contribute to the present form of mismatch, like distraction by co-morbidities, miscalculation of the true benefit to harm balance and a reluctance to undertake or exacerbate poly pharmacy.

In a study of the relation of under prescribing to poly pharmacy in 150 elderly patients, the probability of under prescribing increased significantly with the prescribed number of medicines. This resulted in failure to use β-adrenoceptor antagonists after myocardial infarction(M.I), ACE inhibitors for heart failure, anticoagulants in atrial fibrillation and bisphosphonates in osteoporosis.

Over prescribing - Over prescribing is prescribing a medicine in too high a dosage (too much, too often or for too long). In some cases treatment isn't necessary in any respect. As an example, among hospital patients who got a proton pump inhibitor treatment was indicated in only half. Poly-pharmacy is defined as the use of five or more drugs, occurs in >10% of people aged over 65 years. And although not all poly-pharmacy is inappropriate, some undoubtedly ends up in ADRs and drug-drug interactions.

Overuse of antibiotics is well known and far discussed. A scientific review of 55 trials showed that no single strategy or combination of strategies was better than the other and none was highly effective, although the authors singled out active education of clinicians as a method to pursue.

In a Spanish study, registered practitioner who over prescribed were more likely to be in rural practices, further from specialist centers, caring for kids, lacking postgraduate education and in part-time or short-term work. In many countries, doctors income may have an effect.

8.2 Prescription errors

All the factors that result in medication errors in generally contribute towards prescription errors. They include lack of information, using the incorrect drug name, dosage form, or abbreviation, and incorrect dosage calculations. During a US study of about 900 medication errors in children, ~30% were prescription errors, 25% were dispensing errors and 40% were administration errors. In one study the foremost common form of prescription error was writing the wrong dose. In six Oxford hospitals the most common errors on prescription charts were writing the patient's name incorrectly and writing the incorrect dose, which together accounted for 50% of all errors. During a hospital study of 192 prescription charts, only 7% were correctly filled; 79% had errors that posed minor potential health risks and 14% had errors that could have result in serious harm.[12]

9. DISPENSING ERRORS -

Dispensing errors are errors made during the medication dispensing process that can have serious health consequences for patients. These errors can occur anywhere along the medication process, from prescribing and transcribing errors to dispensing and administration errors. Examples of these errors include inaccurate dose dispense, wrong drug dispense, dispense to wrong patient and selecting the incorrect diluent for reconstitution. Incorrect strength can occur at any point during the medication process. It is usually caused by human error when similar bottles or syringes of the incorrect strength are chosen. In some cases, these errors can result in serious health problems, including drug interactions, adverse drug events, allergic reactions and even death. To prevent these errors, health care providers must be aware of potential risks and take steps to ensure that medications are correctly prescribed, correctly filled, correctly administered, and correctly monitored. Additionally, health care providers must ensure that all staff members are properly trained in medication dispensing and handling protocols and that they are properly supervised when dispensing medication.

Patients may also experience undue distress and suffering as a result of dispensing errors. High workloads of pharmacists, brands or drugs with phonetic similarity, interruptions and distractions in the dispensing process, and the inability to understand a doctor's handwriting are all factors that contribute to dispensing errors.[13]

10. ADMINISTRATION ERRORS-

Errors in administration are mistakes brought on by carelessness or a lack of administrative monitoring. These mistakes can include things like incorrectly filing documentation, failing to follow through on a task, misinterpreting rules or processes, and more. Such mistakes may have serious repercussions for an organization, including financial loss and reputational harm.

Comparatively speaking, a study conducted by Zirpe et al., who reported a 14.1% administration error rate, is lower than Patel et al.'s 31% that they reported in their study. The most common causes of administration errors are incorrect dosing and omission error. When a single dose is provided rather than several doses from vials or ampules, incorrect dose administration occurs. A clinical pharmacist can help prevent such errors by simply noting the number of doses that must be delivered on the medication chart.

Antibiotics, antihypertensives, and analgesics are the most often prescribed classes of medication that are prone to error, according to research by Zeleke et al. The most likely explanation is that these medications are frequently prescribed in the critical care unit. The most frequent medicines implicated in medication errors are meropenem, telmisartan, and paracetamol. It is concerning that pharmaceutical errors—particularly those employing broad-spectrum antibiotics—that result in underdosing could have a significant impact on the development of antimicrobial resistance.[13]

11. CURRENT BEST PRACTICES THAT HOSPITAL CAN ADOPT FOR SMOOTH MEDICATION MANAGEMENT SYSTEM

Develop a medication management system that includes policies, procedures, and processes for handling, storing, and tracking medications. This should include protocols for ordering, dispensing, and administering medication. Implement a barcode medication administration system enables nurses to scan barcodes on medication packages and patient wristbands to ensure that the right medication is given to the right patient at the right time and in the right dosage.[14] Communication among staff is key to ensuring that everyone is on the same page and informed about the medications that are being given to patients. Automated dispensing cabinets can help reduce medication errors by providing the right medication to the right patient at the right time. Establishing proper medication storage and handling procedures can help reduce medication errors and improve safety. Technology can be used to monitor and track medication administration to ensure that all medications are administered correctly and on time. Hospital may have separate medication reconciliation processes for each patient: Having separate medication reconciliation processes for each patient can help reduce medication errors and improve patient safety. Providing education and training for healthcare staff can help ensure that they understand the importance of medication management. Regular audits of medication management systems can help to identify any areas of improvement and ensure that all medications are being administered correctly. Audits can also help to identify any potential errors or problems before they become serious. Automated dispensing cabinets can help to streamline the medication management process by providing a secure, automated way to store and manage medications. This system can also help to reduce medication errors by ensuring that the right medications are being dispensed correctly.[15] Develop and implement a quality assurance program to ensure that the medication management system is working properly and is meeting all regulatory requirements and standards. This may include measures such as double-checking orders and verifying medication information. Establish protocols for the safe storage and handling of medications. This includes proper refrigeration and temperature control, labeling and expiration dates, and secure access. Develop systems to track and monitor medication usage and ensure that all medications are being used according to their intended purpose.[16]

12. ACHIEVING BALANCE PRESCRIBING

9 questions can be be asked before writing a prescription:

Indication: is there an indication for the drug?

Effectiveness: is that the medicine effective for the condition?

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

Other similar drugs: Is that the patient already taking another drug with the same action?

Interactions: are there any clinically important drug–drug interactions with other medicines that the patient is taking?

Dosage: what's the proper dosage regimen (dose, frequency, route, formulation)?

Orders: what're the right directions for giving the drug and are they practical?

Period: what's the suitable duration of therapy?

Economics: is that the drug cost-effective?[16]

13. CONCLUSION: A PRESCRIPTION FOR BETTER PRESCRIBING

We all do errors from time to time. There are so many sources of medication errors and alternative ways to avoiding them. However, we must initiate by being aware that error is feasible and take steps to reduce the risks. The essential element of this are monitoring for and identifying errors, reporting them in an exceedingly blame-free environment, investigation of their root causes, changing procedures according to the lessons learnt and further observation.

How can we modify prescribing and reduce medication errors? Five strategies might help:

℞ Education, to be taken as often as possible (a repetition of prescription—learning should be lifelong).

℞ Special study modules for graduates and undergraduates students, to be taken whenever necessary.

℞ Proper assessment: within the final undergraduate examination, to be taken once or twice; in postgraduate appraisal, to be taken occasionally; this might be linked to a licence to prescribe.

℞ A general prescription form for hospitals, to be applied uniformly and used as a training tool.

℞ Guidelines and computerized prescribing systems, to be taken if indicated (their roles and proper implementation don't seem to be yet clear).

Prescribing medications responsibly is essential for ensuring patient safety. By following best practices for prescribing medications, health care providers can ensure that their patients receive the best possible care. This includes educating patients about their medications and monitoring them closely for any potential side effects or adverse reactions. It is also important to be aware of any potential interactions between medications, and to follow up with patients regularly to review their progress. By taking these steps, health care providers can ensure that their patients receive the best possible care and avoid any potential harm from their medications.

ABBREVIATIONS

APICS: American Production and Inventory Control Society

TNMSC: The Tamil Nadu Medical Services Corporation

GSP: Good Storage Practices

GDP: Good Distribution Practices

DTC: Drugs and therapeutics committee

WHO: World Health Organization

INN: International Non-proprietary Names

EDL: Essential Drug List

PO:Purchase Order

LMICs: Low and Middle-Income Countries

NSSO:National Sample Survey Office

CMS: Central Medical Stores

EPI: Expanded Programme on Immunization

SPO: Store Purchase Organization

MSH: Management Sciences for Health

MI- Myocardial Infraction

ADR- Adverse drug reaction

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