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CHAPTER - 14
MEDICATION ERRORS : CAUSES & PREVENTION*

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Introduction

Drug use is a complex process and there are many drug related challenges at various levels, involving prescriber, pharmacists and patients. While medication misadventure can occur any where in the health care system from prescriber to dispenser to administration and finally to patient use, the simple truth is that many errors are preventable, and pharmacists assume active role in appropriate use of drugs. Pharmacy entails a health science specialty which embodies the knowledge of pharmacology, toxicology, pharmacokinetics and therapeutics for the care of patients. Health care is nearly 10 years behind other industries in its efforts to reduce the errors. According to studies cited in the institute of Medicine report, "to Err is Human; Building a Safer Health System" 44,000 to 98,000 Americans die each year as a result of medical errors. Medication error may be nobody's baby, but when it happens, it could well turn out to be everyone's worry and the reasons given for medication error range from silly to the downright serious.

Medically inappropriate, ineffective and economically inefficient use of pharmaceuticals is commonly observed in the health care system throughout the world especially in the developing countries. Some of the errors though are serious and require attention. The medication error is not only clinically significant in many occasions; it has serious economic consequences like extended hospital stays, additional treatment, and malpractice litigation. [12]

Medication errors

"A medication error is an preventable event that may cause or lead to inappropriate medication use or patient while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, producers and systems, including prescribing; order communication ; product labeling packaging and nomenclature; compounding ; dispensing; distribution; administration; education; monitoring; and use"[3]

Most medication errors are considered latent. For example, when a pharmacist fills a prescription with the incorrect medication, patients typically realize this mistake once they have returned home and have taken the first dose. Latent errors can be described as "accidents waiting to happen " The causes of these types of errors are usually identifiable and can be corrected before the error reoccurs.

- Incomplete patient information (not knowing about patients' allergies, other medicines they are taking , previous diagnoses, and lab results for example)
- Unavailable drug information (such as lack of up-to date warnings)
- Miscommunication of drugs orders, which can involve poor handwriting , confusion between drugs with similar names, misuse of zeroes and decimal points, confusion of metric and other dosing units, and inappropriate abbreviations.
- Lack of appropriate labeling as a drug is prepared and repackaged into smaller units and
- Environmental factors, such as lighting, heat, noise, and interruptions that can distract health professionals from their medical tasks.

Dispensing errors

"Error of wrong interpretation of doctor's prescription and inaccurate calculation of doses

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especially in children." Dispensing error refers to medication errors linked to the pharmacy and includes error of commission (dispensing the wrong drug or dose) and those of omission (failure to counsel on safe use of medicine). Most dispensing errors involve the dispensing of an incorrect medication, dosage strength or dosage form. Look alike and sound alike drug often causes confusion with ineligible prescriptions or verbal medication orders and errors are likely.

Causes for errors

In a data report indicates that pharmacists perceived the following as causative factors for medication errors-

- ? Too many telephone calls (62%)
- ? Overload/ unusually busy day (59%)
- ? Too many customers (53%)
- ? Lack of concentration (41%)
- ? No one available to double check (41%)
- ? Staff shortage (32%)
- ? Similar drug names (29%)
- ? No time to counsel (29%)
- ? Illegible prescription (26%)
- ? Misinterpreted prescription (24%)

Common types of medication errors

The Institute for Safe Medication Practices (ISMP) identifies the following areas as potential causes of medication errors.

? Failed communication: handwriting and oral communications, especially over the telephone, drugs with similar names, missing or misplaced zeroes and decimal points, confusion between metric and apothecary systems of measure, use of nonstandard abbreviations (table-1) ambiguous or incomplete orders

- ? Poor drug distribution practices.
- ? Workplace environmental problems increasing the job stress.
- ? Complex or poorly designed technology.
- ? Access to drugs by non-pharmacy personnel
- ? Dose miscalculations
- ? Lack of information to prescribers
- ? Lack of patient information
- ? Lack of patients' understanding of their therapy

The common error –prone abbreviations & symbols that occur practically are given in Table 1:

Medication error rate

" Medication error rate" is determined by calculating the percentage of errors. The numerator in the ratio is the total number of errors. The numerator in the ratio is the total number of errors that they observe, the denominator is called "opportunities for errors" and includes all the doses observed being administered plus the doses ordered but not administered. The equation for calculating a medication error rate is as follows:

$$\text{Medication Error Rate} = \frac{\text{Number of Errors Observed}}{\text{Opportunities for Errors}} \times 100$$

Medication error rate (MER) A-medication error rate of 5% or

Ta.ble 1

Abbreviation	Intended Meaning	Possible Mis-Interpretation
U	Units	Mistaken as a zero or a four (4) resulting in overdose
Ug	Micrograms	Mistaken for "milligram resulting in a 1,000-fold overdose
QD	Every day	The period after the "Q" has sometimes been mistaken for an "I" and the drug has been given QIID rather than daily
QOD	Every other day	Misinterpreted as "QD" or "QID" If the "O" is poorly written, it looks like a period or an "I"
SC or SQ	Subcutaneous	Mistaken as "SL" (sublingual) when poorly written.
TIW	Three times Wk	Misinterpreted as "three times a day" or "twice" a week.
D/C	Discharge, also discontinue	Patients' medications have been prematurely discontinued when "D/C" was intended to mean "discharge" versus discontinue!"
Cc	Cub.Centimeters	Mistaken as "U" (units) when poorly written
AU,AS,AD	Both ears, left ear, right ear	Misinterpreted as the abbreviation "OU" (both eyes), "OS" (left eye),"OD" (right eye)
HS	Half strength	Misinterpreted as hour of sleep or bed time
Hs	At bed time , hours of sleep	Mistaken as 'N' or intrajugular
IJ	Injection	Mistakes as 'N' or Intrajugular
Trailing zero after decimalPoint (e.g.,1.0mg)	1 mg	Mistaken as 10 mg if the decimal points is not seen
No leading zero before a decimal dose (e,g.,0.5mg)	0.5mg	Mistaken as 5 mg if the decimal point is not seen
AZT	Zidovudine(Retrovir)	Mistaken as Azathioprine or Aztreonam
MTX	Methotrexate	Mistaken as Mitoxantrone
Norflox	Norfloxacin	Mistaken as Norflex
CPZ	Compazine (Prochlorperazine)	Mistaken as Chlorpromazine

above indicates that the facility has systemic problems with its drug distribution system and a deficiency should be written.

Medication errors due to failure to follow label instruction

? **Failure to "shake well":** The failure to "shake" a drug product that is labeled "shake well ". This will almost always lead to an under dose or over dose depending on the suspending abilities of the diluent's and the elapsed time since the last "shake ". Also included under this category is the failure to

"roll" insulin suspensions. Insulin suspensions should not be shaken, they should be "rolled" in order to mix the insulin particles with the diluents without creating air bubbles.

? **Crushing medications:** Crushing tablets or capsules that the label states "do not crush". For an example sustained or extended release dosage form, coated tablets.

? **Medications taken with food or antacids:** The administration of medications without food or antacids when the instruction specifies that food or antacids is taken with or before the medication in order to prevent GI irritation. For example Nonsteroidal Anti-Inflammatory Drugs (NSAID's) taken with food or antacids and whereas, some of the medication is administered in empty stomach or before taking food for better pharmacological & therapeutical action.

? **Sublingual tablets which should not be swallowed:** Swallowing a sublingual tablet (e.g.nitroglycerin, isosorbide dinitrade).If it is swallowed, its absorption is greatly reduced. This will result in less symptom relief.

? **Use of inappropriate solvents :** Some of the drugs (e.g anti cancer drugs) which require reconstitution before administration. Use of inappropriate solvent may reduce the efficacy and potency of the main drug. For example Oxaliplatin must be reconstituted with 5% dextrose only.

Medication error prevention

The National Coordinating Council for Medication Error Reporting and Prevention and Institute for Safe Medication Practices emphasizes that illegibility of prescriptions and medication orders has resulted in injuries to, or deaths of patients. The following recommendations to help minimize errors.

1. The Institute for Safe Medication Practices suggests a number of error prevention tools ranging from forcing functions to independent double-check systems. Prescription orders should include a brief notation of purpose (e.g.for cough), unless considered inappropriate by the prescriber. Notation of purpose can help further assure that the proper medication is dispensed and creates an extra safety check in the process of prescribing and dispensing a medication Independent double-check systems can reduce the risk of error by way of having one person independently check another's work. When this procedure is properly carried out, the likelihood that two individuals would make the same error with the same medication for the same patient is quite low.

2. Forcing functions and constraints they allow for designing processes to ensure that errors are virtually impossible or at least difficult to make. Examples include software programs with "forcing functions " that require the entry of additional pertinent patient information before the order is completed and the medication is dispensed. Automation and computerization of medication use processes and tasks can lessen human fallibility by limiting reliance on memory. Examples include use of technologically and clinically sound computerized drug information system.

3. All prescription orders should be written in the metric system except for therapies that use standard units such as insulin, vitamins, etc. Units should be spelled out rather than writing "U". The change to the use of the metric systems from the archaic apothecary and avoirdupois systems will help avoid misinterpretations of these abbreviations and symbols, and miscalculations when converting to metric, which is used in product labeling and package inserts.

4. Prescribers should include age, and when appropriate, weight of the patient on the prescription or medication order. The most common errors in dosage result in pediatric and geriatric populations in which low body weight is common. The age (and weight) of a patient can help dispensing health care professionals in their double check of the appropriate drug and dose.

5. The medication order should include drug name, exact metric weight or concentration, and dosage form. Strength should be expressed in metric amounts and

concentration should be specified. Each order for a medication should be complete. The pharmacist should check with the prescriber if any information is missing or questionable.

6. A leading zero should always precede a decimal expression of less than one. A terminal or trailing zero should never be used after a decimal. Ten-fold errors in drug strength and dosage have occurred with decimals due to the use of a trailing zero or the absence of a leading zero.

7. Prescribers should avoid use of abbreviations including those for drug names (e.g., MOM, HCTZ) and Latin directions for use. The abbreviations in (table-1) are found to be particularly dangerous because they have been consistently misunderstood and therefore, should never be used.

Conclusion

Pharmacists should ensure that **"right"** patient is receiving the **"right"** drug in a **"right"** dose. Pharmacists and other health care professionals involved in the medication use process must work together to develop a systems approach to medication use process must work together to develop a systems approach to medication error reduction. Moreover, pharmacists with the expert knowledge on drugs perform medication calculations, which are extremely crucial in dosages adjustment . Counseling at the point of delivery in the pharmacy is an area in which pharmacists can significantly improve medication safety and patient compliance. All health care professionals should have a common vision and that everyone works towards a common goal with the monitoring system. Professionals can help monitor each other to achieve the objective of improving the service for patients. From the perspective of the pharmacy profession, we think that we will do the justice by providing such pharmaceutical care services.

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Medication Error Causes. Medication errors are mistakes made by physicians, nurses, and caregivers when they are administering a patientâ€™s medication. These can include incorrect dosage, incorrect method of administration, and even providing the incorrect medication. Medication errors can also be made by patients and their family members if they are administering the medication themselves. Medication errors are a serious and pervasive problem. Studies suggest that one in five nursing home residents suffer from medical errors, and 37% of those medical errors are medication errors. Though most m... Variables associated with medication errors in paediatric emergency medicine.Â Dangerous Wrong-Route Errors with Tranexamic Acidâ€”A Major Cause for Concern. Problem: Earlier this month, we were notified about two cases of accidental intraspinal injection of tranexamic acid, occurring in two different states. Unfortunately, the report was sent anonymously, and we were unable to learn additional details about the events, including the outcome of each...Â According to the Centers for Disease Control and Prevention (CDC), nearly 4 million infants are born in the US each year, including approximately 132,000 multiple births. 1 Unique characteristics of this newborn population pose significant challenges regarding accurate patient identification, which Prevention of medication errors made by nurses in clinical practice. Efstratios Athanasakis. Nursing Student, Alexander Technological Educational Institution, Thessaloniki. 1. ABSTRACT Background: Medication administration to patients is a part of clinical nursing practice with high risk of errors occurrence. The causing factors of medication errors are either individual or systemic. In order to prevent errors before, the establishment of protective measures is pivotal. Purpose: To explore the protective measures taken by nurses to prevent medication errors in clinical practice.