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Diploma in Pharmacy 2nd Year
Hospital & Clinical Pharmacy
Chapter 12 : Medication Errors and Drug Interaction

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Chapter 12

Medication Errors and Drug Interaction

Medication errors

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

Types of Medication Errors

- **Prescribing Error** : This error occurs when due to mistake of prescriber (Doctor) , such as wrong drug , dosage , administration route etc.
- **Omission Error** : This error occurs when patient is not given a scheduled prescribed drug in health care control , like hospital , nursing home etc.
- **Improper Dose Error** : This error occurs when a patient is given a higher or lower dose in comparison to prescribed dose.
- **Deteriorated (Expired) Drug error** : This error occurs when expired drug is administered .
- **Prescription Filling(Dispensing) Error** : This error occurs when drugs are not dispensed properly according to the prescription.
- **Unauthorised Drug error** : This error occurs when patient is given a medication without consent(willing) of prescriber.
- **Wrong Time Error** : This error occurs when drug is not administered at appropriate time . (too soon or too late)
- **Wrong dosage Error**
- **Wrong drug preparation error**
- **Wrong administration technique error**
- **Monitoring Error**
- **Compliance Error** : This error occurs when patient do not complete a prescribed medication course.

Consequences

- Medical errors can have serious consequences for patients, their families, and healthcare providers. Here are some of the consequences of medical errors:
- **Patient harm or death** : Medical errors can cause physical harm, emotional trauma, or even death to patients.
 - **Longer hospital stays** : Medical errors can result in extended hospital stays, increasing healthcare costs, and delaying the recovery process.
 - **Increased healthcare costs** : Medical errors can lead to additional medical interventions, prolonged hospital stays, and increased healthcare costs.
 - **Loss of trust** : Patients may lose trust in their healthcare providers or the healthcare system as a whole due to medical errors.
 - **Legal consequences** : Medical errors can result in malpractice claims, lawsuits, and legal actions against healthcare providers or institutions.
 - **Psychological impact** : Medical errors can cause emotional trauma, stress, anxiety, or depression for patients, their families, and healthcare providers.
 - **Reputation damage** : Medical errors can damage the reputation of healthcare providers or institutions, leading to loss of business or negative publicity

Strategies to Minimize Medication Error

- ✓ Separate prescription should be written for each medication
- ✓ Before signing the prescription the prescriber should recheck every parts of the prescription
- ✓ Abbreviation of drug names should be avoided
- ✓ The patient age should be mentioned in the prescription
- ✓ The pharmacist should read the prescription carefully and should follow every steps of dispensing of the drugs
- ✓ The pharmacist should check, if the doses are adequate or not , according to patient age
- ✓ The nurses Should administered the right drug to the right patient in right dose at right time.
- ✓ Multitask should be avoided during prescribing dispensing and administrating the drug.
- ✓ The health care professional should be stress free
- ✓ The workload of healthcare professionals should be in limit
- ✓ LASA drugs should be handled carefully
- ✓ Prescriber should write the prescription himself and should avoid dictation

LASA drugs

- LASA" stands for "Look-Alike-Sound-Alike" drugs, which are medications that have similar names or packaging but differ in their active ingredients or dosages.
- Look Alike Sound Alike (LASA) medications involve medications that are visually similar in physical appearance or packaging and names of medications that have spelling similarities and/or similar phonetics
- This can lead to medication errors if healthcare providers or patients mistake one drug for another.
- To prevent medication errors with LASA drugs, healthcare providers should always double-check the medication name and dosage before administering or prescribing it, and patients should always confirm with their healthcare provider or pharmacist that they have received the correct medication.
- In addition, it's important to store medications in their original packaging and to keep a current list of all medications, including their names, dosages, and purposes.
- Common Risk Factors Common risk factors associated with LASA medications includes:
 - Illegible handwriting
 - Incomplete knowledge of drug names
 - Newly available products
 - Similar packaging or labelling
 - Similar strengths, dosage forms, frequency of administration
 - Similar clinical use

Strategies to avoid errors with Look Alike Sound Alike Medications

- ▲ Procurement
- ▲ Storage
- ▲ Prescribing
- ▲ Dispensing/ Supply
- ▲ Administration
- ▲ Monitoring
- ▲ Information
- ▲ Patient Education
- ▲ Evaluation

Tallman lettering as per ISMP

- The term " Tall Man Lettering " is discovered by the Institute for Safe Medication Practices (ISMP).
- Tall Man Lettering is a technique to differentiate (distinguish) the similar drug names and cause mistake during dispensing , handling administrating.
- In this technique the main part of the drug names is written in Upper Case Lettering (In Capital letter) and the parts of the drug names similar to the other drug names are written in Lower Case (Small letter).
- This technique highlights the distinctive part of the drug names and reduces the chances of mistake.

Examples Drug

Name with Tall Man Letters	Confused with
chlopro MAZINE	chlorpro PAMIDE
DOP amine	DO BUTamine
cyclo SPORINE	cyclo SERINE
vin BLAS tine	vin CRIS tine

Drug Interactions

- A drug interaction is a reaction between two (or more) drugs or between a drug and a food, beverage, or supplement.
- Or**
- Drug Interaction is a condition in which an another drug or food affects the drug action (Increases or decreases the effect)
 - Taking a drug while having certain medical conditions can also cause a drug interaction. For example, taking a nasal decongestant if you have high blood pressure may cause an unwanted reaction

Types

- 1) Drug-Drug interaction
- 2) Drug-food Interaction Examples of Drug to drug Interaction

1) Drug-Drug interaction

Analgesics	Interacting Drugs	Possible Effects
1) Opioids	Phenoxybenzamine	The depressor effect of opioids is exaggerated.
2) Salicylates	Alkalinisers and antacids	The serum levels of salicylate decreases as the renal reabsorption of salicylate from alkaline urine reduces.
3) Salicylates	Indomethacin	The serum level of indomethacin decreases due to inhibition of gastrointestinal absorption.
4) Salicylates	Acidifiers, ascorbic acid, and ammonium chloride	The serum levels of salicylate increases due to enhancement in the renal absorption of salicylate from acidic urine.
5) Salicylates	Heparin and warfarin	Aspirin inhibits platelet aggregation, thus giving rise to additive effect which causes bleeding.
6) Salicylates	Probenecid	The uricosuric activity of probenecid decreases as both compete for the same binding site (albumin molecule) on plasma.
7) Phenylbutazone	Tolbutamide	The hypoglycaemic response increases as tolbutamide metabolism is inhibited.

Hypoglycaemic Drugs	Interacting Drugs	Possible Effects
1) Hypoglycaemic drug	Alcohol	The hypoglycaemic effect of alcohol causes hypoglycaemia.
2) Hypoglycaemic drug	Oral contraceptives	Glucose tolerance impairs.
3) Insulin	Propranolol	The insulin activity increases.
4) Sulfonylureas	Anticoagulant	The hypoglycaemic activity increases.
5) Sulfonylureas	Rifampin	Hypoglycaemia occurs due to increase in metabolism.

Table 12.4: Diuretics

Diuretics	Interacting Drugs	Possible Effects
1) Furosemide, thiazides, and ethacrynic acid	Sulfonylureas	The effect of sulfonylureas antagonises due to depression of islets of Langerhans.
2) Thiazides	Methyldopa, guanethidine, and reserpine	The antihypertensive effects are increased by thiazides and this may cause hypotension.
3) Furosemide, thiazides, and ethacrynic acid	Digoxin	The cardiac effect and toxicity due to potassium depletion enhances.
4) Furosemide	Phenytoin	Response of furosemide decreases due to increase in sodium absorption.
5) Acetazolamide	Quinidine	The serum level of quinidine increases.
6) Spironolactone	Potassium chloride	Hyperkalaemia occurs as spironolactone is a potassium sparing diuretic.

Table 12.6: Gastrointestinal Drugs

Gastrointestinal Drugs	Interacting Drugs	Possible Effects
1) Antacids	Aspirin	The absorption of aspirin decreases.
2) Magnesium carbonate and magnesium trisilicate	Digitalis glycoside	The absorption of cardiac glycosides decreases.
3) Aluminium hydroxide gel	Isoniazid	The absorption of isoniazid decreases.
4) Metoclopramide (antiemetic)	Levodopa	The absorption rate of levodopa decreases due to decrease in GIT motility.
5) Kaolin-pectin mixture	Digoxin	The absorption of digoxin decreases.

2) Drug-food Interaction Examples of Drug to drug Interaction

→ Drug-Food Interactions When a food/nutrient alters the effects of a drug, the alteration is considered a food-drug interaction. It can occur with prescription drugs, OTC drugs, herbal products, and dietary supplements

Table 12.9: Some Commonly Occurring Drug-Food Interactions

Drugs	Food/Nutrient	Interactions
Allopurinol	1) Avoid low protein diet 2) Avoid low fluid content	1) A low protein diet will result in higher blood levels of this drug. 2) The individual should drink plenty of fluids while taking this drug.
Antacids: 1) Aluminium/Magnesium hydroxide/Simethicone 2) Aluminium carbonate basic 3) Aluminium hydroxide	Avoid high protein meals	High protein meals decrease the neutralising capacity of the antacid.
Calcium channel blockers: 1) Felodipine 2) Nifedipine 3) Amlodipine	Avoid grapefruit juice	Drinking grapefruit juice with this drug will result in higher than desired blood levels of the drug. These higher levels may be harmful and cause adverse effects.
Carbamazepine	Avoid grapefruit juice	Drinking grapefruit juice with this drug will result in higher than desired blood levels of the drug. These higher levels may be harmful and cause adverse effects.
Cephalosporins: 1) Cefotetan 2) Cefoperazone 3) Cefamandole 4) Cefmetazole 5) Moxalactam	Avoid alcoholic beverages	Drinking alcohol with these drugs can develop disulfiram reaction characterised by flushing, vomiting, rapid breathing, and rapid heart rate.
Disulfiram	Avoid alcoholic beverages	Drinking alcohol with this drug can develop disulfiram reaction characterised by flushing, vomiting, rapid breathing and heart rate.
Iron: 1) Ferrous sulphate 2) Ferrous gluconate	1) Consume foods rich in Vitamin C 2) Avoid dairy products with iron	1) These food items enhance the amount of iron the body absorbs. 2) Taking this drug with food reduces the amount of iron the body absorbs.
Fluoroquinolones: 1) Ciprofloxacin 2) Levofloxacin 3) Gatifloxacin 4) Sparfloxacin	Avoid calcium-rich foods, mineral supplements, and caffeine	These food items decrease the amount of drug the body absorbs, as they bind to form insoluble complexes.

Clinical significance of drug interactions

- **Decreased effectiveness** : When two drugs interact, the effectiveness of one or both medications may be reduced. This can result in a decreased therapeutic effect, which can lead to inadequate treatment of the underlying condition.
- **Increased toxicity** : Drug interactions can also result in an increased risk of adverse effects or toxicity. For example, when two drugs that are metabolized by the same enzyme are taken together, they may compete for the enzyme, leading to an accumulation of one or both drugs and an increased risk of toxicity.
- **Altered pharmacokinetics** : Drug interactions can also alter the pharmacokinetics (i.e., the way the drug is absorbed, distributed, metabolized, and eliminated) of one or both medications. This can result in changes in the blood levels of the drugs, which can affect their effectiveness and toxicity.
- **Potentialiation** : Drug interactions can also result in a potentiation of the effects of one or both drugs. For example, when two drugs that have a similar effect on the central nervous system (such as two sedatives) are taken together, they may have a greater effect than when taken alone.

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