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Pharmacology in Nursing

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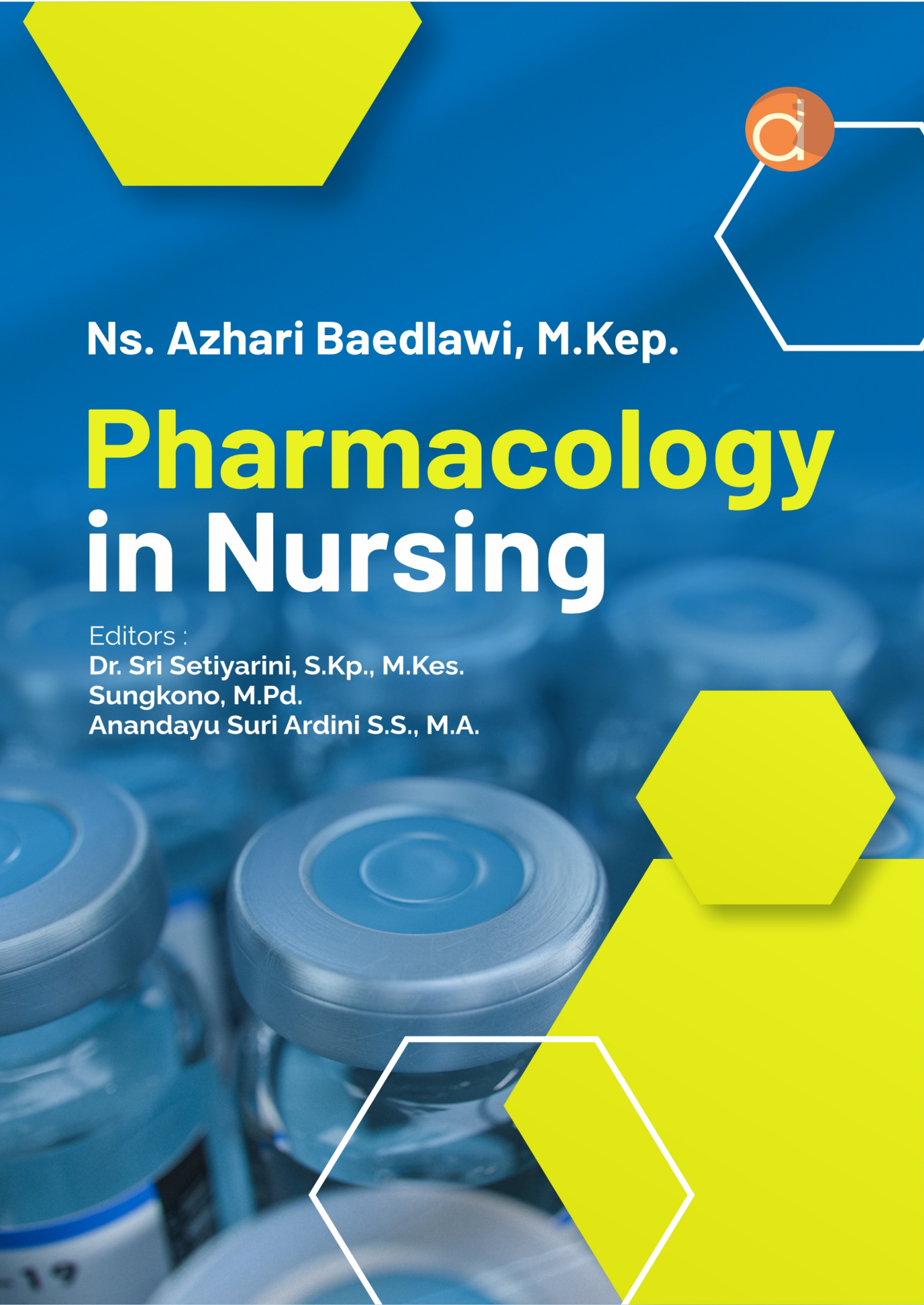

Pharmacology in Nursing

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Cerdas, Bahagia, Mulia, Lintas Generasi.

PHARMACOLOGY IN NURSING

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PREFACE

This pharmacology course is a second-semester, first-year course that covers fundamental pharmacology concepts, roles, forms of classification and drug classification, and principles of drug administration. This course focuses on drug management within the context of the nursing profession. This course is related to other courses, providing students with the skills necessary to manage drugs when providing nursing care. This course also examines the pharmacology and biochemistry of drugs. This instructional material can aid students in comprehending drug management and applying patient safety rules. The lecture format employs blended learning. There are various learning activities, including lectures, discussions, and demonstrations. The book also includes practice scenarios and comprehension tests to assess student comprehension. This pharmacology's straight relevance to the nursing field will serve as the foundation for understanding the nursing process.

The Objectives

The goals of pharmacology study in the field of nursing are as follows:

1. You can explain the fundamental concepts of pharmacology
2. You can analyze drug classification based on disorders of body systems
3. You can analyze the function of nurses in drug management

4. You can demonstrate drug management in providing nursing care in a safe and procedure-compliant manner

Guidelines for Utilizing Educational Materials

Guidelines for Students

You can maximize your use of this instructional material by paying close attention to the following study instructions:

1. Read and comprehend each learning activity's description of the core material and additional material. You may inquire if something is unclear.
2. Assess your comprehension by completing practice questions or comprehension tests in instructional materials.
3. Form small groups to enhance your comprehension.
4. Utilize reliable and current learning resources in the nursing pharmacology field to respond to various case discussions presented in learning activities.

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UNIT 1.

BASIC PRINCIPLES OF PHARMACOLOGY

LEARNING OBJECTIVES

Please read carefully the learning objective of this topic.

After you learn this topic, you will be able to analyze the basic concepts of pharmacology in nursing.

OUTLINE

This is the outline of the topic 1.

- History of pharmacology before – after century and modern era
- Pharmacology
- Clinical Pharmacology
- Drug
- Therapeutic
- Connecting pharmacology and nursing care
- Efficacy and effectiveness
- Safety
- Pharmacokinetics
- Pharmacodynamics
- Adverse effect
- Toxicity

The History of Pharmacology Before – After Century and Modern Era

The history of pharmacology is fascinating and full of significant incidents and unintentional discoveries. Its history began when people utilized a plant for the first time to treat sickness symptoms. Herbal therapy is one of the oldest types of healthcare, having been practiced for ages in all major civilizations. The oldest known prescriptions were written down

on clay tablets by the Babylonians about 3000 BC. It appeared valid to be a treatment despite irrational development methods (Adams and Urban, 2019). On around 2700 BC, the Chinese documented Great Herbal called Pen Tsao, while the Egyptians created over 700 magical prescriptions on around 1500 BC. On 201 AD, Greek physicians described over 1000 herbal remedies. Over the years, pharmacology uses in medicine have grown, and the nurses now play a critical part in the efficacy of pharmacotherapy. There are not many historical instances of which pharmacological therapy were documented (Adams, Holland, and Urban, 2017; Adams and Urban, 2019).

Modern pharmacology began in the early 1800s, even though there was still much unclear information. Scientists at the time were isolating certain compounds from intricate combinations with surprising success. This made it possible for scientists to separate the active ingredient of early medications including cocaine, colchicine, curare, morphine, and others from their natural plant components. The term of modern pharmacology was originally derived from a Latin term *Pharmacologia sen Manuductio and Materiam Medicum* in 1963. This term means medical matters continuing to be used in the beginning of the 20th century (Adams and Urban, 2019).

Pharmacology

According to The National Center for Biotechnology Information dictionary, pharmacology is defined as '*drugs and exogenously administered chemical substances for their effects on living tissues and organisms. It includes acceleration and inhibition of physiological and biochemical processes and other*

pharmacologic mechanisms of action' (*pharmacology - MeSH - NCBI*, 1988).

Pharmacology can also refer to the study of drugs and their interactions with living systems. Under this definition, pharmacology encompasses the study of the physical and chemical properties of drugs as well as their biochemical and physiological effects. In addition, pharmacology includes knowledge of the history, sources, and uses of drugs as well as knowledge of drug absorption, distribution, metabolism, and excretion. Because pharmacology encompasses such a broad spectrum of information, it would be impossible to address the entire scope of pharmacology in this text. Consequently, we limit the consideration to information that is clinically relevant (Burchum, Rosenthal and Lehne, 2019).

Clinical Pharmacology

Clinical pharmacology can be defined as a fundamental and more rational development of drugs. Clinical pharmacology is considered safer and efficient for treating patients (Liu et al., 2021). Moreover, clinical pharmacology is defined as the study of drugs in humans. This discipline includes the study of drugs in patients as well as in healthy volunteers (during new drug development). Because clinical pharmacology encompasses all aspects of the interaction between drugs and people, and since our primary interest is the use of drugs to treat patients, clinical pharmacology includes some information that is outside the scope of this text (Burchum, Rosenthal and Lehne, 2019).

Drug

Drug is defined as any chemical that can affect living processes. By this definition, basically all chemicals can be considered as drugs, since, when the exposure is sufficiently high, all chemicals will have some effects on living creatures. Clearly, it is beyond the scope of this text to address all compounds that fit the definition of a drug. Accordingly, rather than discussing all kinds of drugs, we will focus primarily on drugs that have therapeutic impact (Adams, Holland, and Urban, 2017; Burchum, Rosenthal and Lehne, 2019).

Therapeutic

Therapeutics, also known as pharmacotherapeutics, is defined as the use of drugs to diagnose, prevent or treat disease, or to prevent pregnancy. Alternatively, therapeutics can be defined simply as the medical use of drugs. In this text, therapeutics is our principal concern. Accordingly, much of our discussion focuses on the basic science that underlies the clinical use of drugs. This information is intended to help you understand how drugs produce their therapeutic and adverse (undesirable) effects, the reasons for giving a particular drug to a particular patient, and the rationale underlying selection of dosage, route, and schedule of administration. This information will also help you understand the strategies employed to promote beneficial drug effects and to minimize undesired effects. Armed with this knowledge, you will be well prepared to provide drug-related patient care and education. Additionally, by removing the unknown information surrounding drugs, it should be able to enlighten you about the potential use of drugs (Burchum, Rosenthal and Lehne, 2019).

Connecting Pharmacology to Clinical Nursing Practice

Pharmacotherapy has a strong connection with nursing practice. One of the key areas of nursing science is pharmacotherapy, which involves understanding the effects of medications and keeping track of those that are required. Nurses need to be aware of pharmacotherapy when providing nursing intervention. As members of an interprofessional team, nurses, physicians, advanced practice nurses, pharmacists, and, most importantly, the patient should work together to achieve optimal therapeutic outcomes from drug therapy. The importance of pharmacology to clinical nursing practice should not be underrated, and the connection between pharmacology and nursing practice should be emphasized (Adams and Urban, 2019).

A major goal in studying pharmacology is to eliminate medication errors and to limit the number and severity of adverse drug events. Many adverse effects are preventable. Some others, however, are not. It is vital that the nurses are well prepared to recognize and respond to potential adverse effects of medications. Before any drug is administered, the nurse must obtain and process pertinent information regarding the patient's medical history, physical assessment, disease processes, and learning needs and capabilities. Growth and mental development characteristics also affect therapy success. Having a thorough understanding of these factors can improve the success of treatment (Adams and Urban, 2019; Ernstmeyer and Christman, 2023).

For a nurse, attaining knowledge about pharmacology is an ongoing, lifelong process that they can pursue along with their nursing practice journey as they choose specific clinical

areas. This basic knowledge can be built through several ways such as learning particular classification of drugs through its prototypes, understanding key similarities in generic names, and searching for information about new or unknown drugs. Through more practices, nurses are able to foresee pharmacological effects. This clinical experience benefits an advanced practice nurse who works as a nurse practitioner by enhancing the fresh knowledge learned to get ready for prescriptive authority (Adams and Urban, 2019).

Efficacy and Effectiveness

An effective drug is one that elicits the responses for which it is given. Effectiveness is the most important property a drug can have. Regardless of its other virtues, if a drug is not effective—that is, if it does not do what it is intended to do—there is no justification for giving it (Burchum, Rosenthal and Lehne, 2019).

The efficacy of the drug can be defined as a drug's effectiveness, often assessed by its capacity to stimulate a quantifiable biological reaction. Medication distribution and disposition of the active form responsible for physiological effects are critical factors in therapeutic drug pharmacological efficacy. Effectiveness is viewed as an intrinsic attribute of the receptor pair in the framework of the classical receptor-occupancy theory, and it is frequently thought to remain constant for all the responses generated by this pair. The effectiveness idea was reevaluated in light of the realization that a single receptor can activate several signalling pathways and that diverse medicines binding to this receptor may differentially influence

each pathway (Galandrin, Oligny-Longpré and Bouvier, 2007; Gimenez-Bastida et al., 2018).

Efficacy trials, designed to gain regulatory marketing approval, evaluate drugs in optimally selected patients under advantageous conditions for relatively short time periods. Effectiveness trials, designed to evaluate use in usual practice, assess treatments among more typical patients in real-world conditions with longer follow-up periods (Gimenez-Bastida et al., 2018).

Safety

A safe drug is defined as one that cannot produce harmful effects—even if administered in very high doses and for a very long time. All drugs have the ability to cause harm, especially with high doses and prolonged use. The chances of producing harmful effects can be reduced by proper drug selection and proper dosing. However, the risk of harmful effects can never be eliminated. The following examples illustrate this point (Burchum, Rosenthal and Lehne, 2019):

- Certain anticancer drugs (e.g., cyclophosphamide, methotrexate), at usual therapeutic doses, always increase the risk of serious infection.
- Opioid analgesics (e.g., morphine, meperidine), at high therapeutic doses, can cause potentially fatal respiratory depression.
- Aspirin and related drugs, when taken long term in high therapeutic doses, can cause life-threatening gastric ulceration, perforation, and bleeding.

Clearly, drugs have both benefits and risks. This fact may explain why the Greeks used the word pharmakon, which can

be translated as both remedy and poison (Burchum, Rosenthal and Lehne, 2019).

Selectivity

A selective drug is defined as one that elicits only the response for which it is given. There is no such thing as a wholly selective drug because all drugs cause side effects. Common examples include the drowsiness caused by many antihistamines; the peripheral edema caused by calcium channel blockers; and the sexual dysfunction commonly caused by certain antidepressants (Galandrin, Oligny-Longpré and Bouvier, 2007; Burchum, Rosenthal and Lehne, 2019).

Pharmacokinetics

Pharmacokinetics is the term that describes the four stages of the drug process (Ernstmeyer and Christman, 2023). There are four basic pharmacokinetic processes that is: absorption, distribution, metabolism, and excretion (Burchum, Rosenthal and Lehne, 2019).

Absorption is defined as the movement of a drug from its site of administration into the blood. Drug absorption is transport of drug from administration into systemic circulation. The level of absorption is referred to as the bioavailability. In other terms, bioavailability is the percentage of a medicine that is provided that enters the bloodstream in an unmodified state (Burchum, Rosenthal and Lehne, 2019; Raj and Raveendran, 2019).

Distribution is defined as drug movement from the blood to the interstitial space of tissues and from there into cells (Burchum, Rosenthal and Lehne, 2019). Drug distribution phase consist of initial phase and second phase. Initial phase

occurs when drug distribute to highly vascular organs like liver, kidney, and brain, while second phase performs on muscle, skin and fat slowly (Lakshmanan, 2019).

The other process of pharmacokinetic is metabolism. **Metabolism** (biotransformation) is defined as enzymatically mediated alteration of drug structure. Most xenobiotics and endogenous compounds are eliminated from the body primarily through drug metabolism. Drug metabolism can mostly take place in the liver and kidney, while the GI tract, lungs, skin, and plasma contributing a negligible contribution (Burchum, Rosenthal and Lehne, 2019; Lakshmanan, 2019).

Excretion is the movement of drugs and their metabolites out of the body. The combination of metabolism plus excretion is called elimination (Burchum, Rosenthal and Lehne, 2019). In the excretion of drug, the drug moving constantly from inside to outside the body. The important organ of excretion process is kidney. And then followed by another organ like liver, lungs, skin, salivary glands, mammary gland, and semen (Pichai and Lakshmanan, 2019).

Pharmacodynamic

Pharmacodynamic is different with pharmacokinetic. Pharmacodynamic attains the drug action of organism. Pharmacodynamic works by stimulate the receptor, distressing the receptor, blocking the receptor, stabilizing action, and processing direct chemical reaction (Marino, Jamal and Zito, 2023). If the drug interacts with another drug called by pharmacodynamic drug interaction process. Pharmacodynamic learns about action of drugs, biochemical and physiologic effects. All drug reacts of biological structure and transforms the

target molecule functions into intermolecular interactions. The interactions process such as receptor binding, post-receptor effects, and chemical interactions (Niu, Straubinger and Mager, 2019; Marino, Jamal and Zito, 2023).

Adverse Effect

One of the leading causes of patient morbidity and mortality is adverse drug reactions (ADR). This Adverse Drug Reactions occur when the effect of drug altered the normal body metabolism (Hanafi et al., 2012). A significant proportion of unscheduled hospital admissions are precipitated by and involve adverse drug reactions (ADRs) – unintended, harmful events attributed to the use of medications. Preventing ADRs requires avoiding treatment in cohorts of patients with increased susceptibility or administering therapy by a therapeutic plan that reduces the risk of an adverse effect (Coleman and Pontefract, 2016).

Toxicity

It has been estimated that toxicity is responsible for the loss of 1/3 of therapeutic candidates and is a substantial contributor to the high cost of medication research, particularly when not discovered until late in clinical trials or after marketing. Drug toxicity mechanisms can include some processes such as mechanism-based toxicity, immune hypersensitivity, off-target toxicity, and bioactivation change (Guengerich, 2011).

SUMMARY

- Pharmacology began with the use of plants to treat sickness symptoms, and herbal therapy is one of the

oldest types of healthcare.

- ❖ Therapeutics is the use of drugs to diagnose, prevent, treat, or prevent disease.
- ❖ Pharmacotherapy is a key area of nursing science that involves understanding the effects of medications and keeping track of those required.
- ❖ Effectiveness is the most important property of a drug, as it determines its effectiveness.
- ❖ Effectiveness of a drug is assessed by its capacity to stimulate a biological reaction, and is often seen as an intrinsic attribute of the receptor pair.
- ❖ Nurses' knowledge and attitude towards pharmacovigilance is essential for patient safety.
- ❖ Drug toxicity is a major cost of medication research, affecting 1/3 of therapeutic candidates.

FORMATIVE TEST

Please answer the questions below!

1. What is the definition of pharmacology?
2. What is the difference between pharmacodynamic and pharmacokinetic?
3. How does the drug become effective and efficient when distributed onto the market?

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UNIT 2.

DRUG CLASSIFICATION AND CODE

LEARNING OBJECTIVES

Please read carefully the learning objective of this topic.
After you learn this topic, you will be able to analyze the classification of drugs and code

OUTLINE

- Pharmacology of the cardiovascular system
- Pharmacology of the immune system
- Pharmacology of the respiratory system
- Pharmacology of the endocrine system
- Pharmacology of the gastrointestinal system
- Pharmacology of the nervous system

Pharmacology of the Cardiovascular System

Have you ever heard about heart disease? People with heart disease must be threatened rapidly. There are several explanations for drug-related cardiovascular disorders. Cardiovascular disorders need not only surgical treatment but also medication for heart disease survivors (American Heart Association, 2023).

Table 2.1 Describe medication in cardiovascular systems. There are several classifications of drugs related to cardiovascular illness (American Heart Association, 2023).

Drug's classification	Commonly prescribed	Pharmacokinetics and pharmacodynamics	Indication	Nursing concern/ adverse event
Anticoagulants	• Apixaban (Eliquis) • Dabigatran (Pradaxa) • Edoxaban (Savaysa) • Heparin (various) • Rivaroxaban (Xarelto) • Warfarin (Coumadin)	Reduces the blood's clotting (coagulating) capacity	They are used to Prevent harmful clots, prevent serious problem of blood clots, for first or recurrent stroke	Increase bleeding, shortness of breath, skin rashes and hair loss
Antiplatelet agent	• Aspirin • Clopidogrel (Plavix) • Dipyridamole (Persantine) • Prasugrel (Effient) • Ticagrelor (Brilinta)	Prevents blood platelets from adhering to one another, preventing the formation of blood clots	They are used to avoid clotting who have had a heart attack, prescribed preventively, for dual therapy	Chest pain, abnormal electrocardiogram, headache, dizziness
Angiotensin II Receptor Blockers	• Azilsartan (Edarbi) • Candesartan (Atacand) • Eprosartan (Teveten) • Irbesartan (Avapro) • Losartan (Cozaar)	Angiotensin II receptor blockers avoid chemical interaction from heart and blood vessels having effect. This prevents an increase in blood pressure.	They are used to treat or improve cardiovascular symptoms, including excessive blood pressure and heart failure.	Headache, fainting, dizziness, fatigue

Drug's classification	Commonly prescribed	Pharmacokinetics and pharmacodynamics	Indication	Nursing concern/ adverse event
Digitalis preparations	Digoxin (Lanoxin)	Improve heart's contractions to perform heart failure and arrythmia	They used to decrease heart failure syndrome, arrythmia related atrial fibrillation	Irregular heartbeat, palpitations, shortness of breath, sweating and fainting
Diuretics	• Acetazolamide (Diamox) • Bumetanide (Bumex) • Chlorothiazide (Diuril) • Furosemide (Lasix) • Hydro-chlorothiazide (Esidrix, Hydrodiuril)	• Release excess fluids and sodium • Relieve heart's workload • Remove fluid from lungs and other part of body	• They used to decrease blood pressure • They used to relieve edema	Increased of elimination, increased sensitivity of sunlight, increased uric acid level in blood and headaches
Vasodilators	• Isosorbide dinitrate (Isordil) • Isosorbide mononitrate (Imdur) • Hydralazine (Apresoline) • Nitroglycerin (Nitro Bid, Nitro Stat) • Minoxidil	To rest and relieve blood pressure	They are used to reduce chest pain (angina)	Dizziness, headache, chest pain, heart palpitations, edema.

For further explanation, you may visit https://www.heart.org/en/health-topics/heart-attack/treatment-of-a-heart-attack/cardiac-medications.

Pharmacology of the Immune System

Immunopharmacology is preoccupied with combination therapy. Immunopharmacology seeks to comprehend inflammation and immune mechanisms and manipulate the immune system to treat disorders (Kester et al., 2012). Immunosuppressive medications serve a crucial role in the treatment of immune disorders. As immunosuppressive agents, monoclonal antibodies targeting proteins with crucial functions in immune responses are increasingly being developed. In certain circumstances, drugs that augment the immune response are advantageous (Trevor et al., 2013).

Table 2.2 describe about common drug used to treat immune disorder.

Drug's classification	Commonly prescribed	Pharmacokinetics and pharmacodynamics	Indication	Nursing concern/ adverse event
Immunomodulators	Thalidomide (Thalomid) Lenalidomide (Revlimid) Pomalidomide (Pomalyst) Imiquimod (Aldara, Zyclara)	Immunomodulators works in two ways with stimulate or suppress the immune system	Serious illness like cancer.	Drowsiness, fatigue, constipation, low blood cell counts, neuropathy
Immunosuppressant	Prednisone (Deltasone, Orasone) Budesonide (Entocort EC) Prednisolone (Millipred)	Suppress or reduce the system immune of the body	Autoimmune disorder like lupus, psoriasis, and rheumatoid arthritis.	Fever, pain in lower back, trouble urinating, pain while urinating, tiredness

Further study, please kindly visit this site https://www.healthline.com/health/immunosuppressant-drugs#side-effects.

Pharmacology of the Respiratory System

Bronchoconstriction, inflammation, and loss of lung elasticity are the most common processes that result in respiratory compromise. Bronchoconstriction can be treated with adrenergic agonists, cholinergic antagonists, and some other compounds. Inflammation is treatable with corticosteroids. Obstruction of the airways can also occur with infection and increased secretions. The infection is treated with antibiotics. Because the antibiotics and steroids have been covered elsewhere, this chapter focuses on the bronchodilators. Most of this will be a review from autonomics. This Table 2.3 explain you about drugs in respiratory system.

Classification	Drug Name	Action mechanism	Indication	Nursing concern/ adverse event
Respiratory stimulants	doxapram, caffeine (Cafcit, NoDoz), theophylline (Elixophylline, Theo-24), aminophylline	Stimulate respiratory center in the brainstem and medulla → respiratory stimulation Phosphodiesterase enzyme inhibitors → bronchodilation	Asthma, Respiratory depression, apnea prematurity	Muscle tremors, agitation, anxiety, irritability, insomnia, hypertension, tachycardia, nausea, vomiting
Inhaled corticosteroids	Beclomethasone, budesonide, fluticasone, mometasone, triamcinolone	Reducing inflammation in the bronchial tubes and reducing mucus production	Use to treat bronchoconstriction	Adrenal suppression, bone loss, skin thinning, cataract formation
B-agonists	Albuterol, levalbuterol, arformoterol salmeterol.	β2-Selective agents are preferred, to avoid the cardiac effect of β1-activation.	Treat acute bronchospasm and prevent exercise-induced asthma	-
Cholinergic antagonists	IPRATROPIUM (short-acting), tiotropium	Block the bronchoconstrinction due to parasympathetic nervous system activation	Treat chronic obstructive pulmonary disease (COPD)	Less effective against asthma
Methyxanthines	Theophylline or aminophylline	Increase cAMP levels, cause bronchodilation is under investigation	To treat asthma	--

Please kindly read this website for more information: https://www.osmosis.org/learn/Respiratory_stimulants:_Nursing_Pharmacology.

Pharmacology of Endocrine System

Endocrine disorders are unique because treatment can be explicitly directed at the malfunctioning pathway. Endocrine treatment is characterized by hormone replacement therapy in hypofunction diseases and specific antihormone therapy in hyperfunction disorders. Consequently, endocrine medications are among the safest in the therapeutic arsenal, or at least the most frequently used. However, despite being less dangerous than certain groups, such as chemotherapy agents or anticoagulants, they are also associated with severe neurologic adverse events (AEs) (Rosa & And, 2014).

Table 2.4 describe about common drug used to treat endocrine disorder.

Drug's classification	**Commonly prescribed**	**Pharmacokinetics and pharmacodynamics**	**Indication**	**Nursing concern/ adverse event**
Thyroid drug	Levothyroxine (Eltroxin)	Levothyroxine same as thyroxine synthetic hormone.	Hypothyroidism	Tremor, nervousness, irritability, headache, insomnia, behavior disturbance
Thyroid drug	Thiamazole	Thiamazole works by inhibiting thyroid hormone production. It does this by blocking the enzyme responsible for the production of thyroid hormone.	Hyperthyroidism	Nausea/vomiting, ageusia, dizziness, arthralgias/myalgia, paresthesias, headaches

For further learning, please visit this site https://www.nhs.uk/medicines/levothyroxine/.

Several drugs used to treat endocrine disorder like diabetes mellitus. Through diabetic treatment not only for blood glucose control, but also to avoid complication related diabetes mellitus such as retinopathy, nephropathy and neuropathy. Some drug works in diabetic condition is insulin and noninsulin drugs (Rosa & And, 2014).

Table 2.5 Drug used in diabetes mellitus

Drug's classification	Commonly prescribed	Pharmacokinetics and pharmacodynamics	Indication	Nursing concern/ adverse event
Insulines as a whole	Aspart, glulisine, lispro, reguler, NPH, detemir, glargine	Insulin is used as replecement therapy for patients with an absolute or relative deficiency of the hormone. Insulin replacement is therefore lifesaving for type 1 diabetes (T1DM) and also needed for achieving a good glucose control in T2DM.	To treat diabetic illness	Hypoglicemia, listlesness, confusion, palpitation, headache, sweating (Very common)
Noninsuline drug used in diabetes	Glibenclamide, glimepiride, metformin, miglitol, pioglitazone repaglinide		Treat type 2 diabetes, monotherapy only if metformin not indicated	Hypoglycemia, dizziness, headache, dysgeusia

Pharmacology of Gastrointestinal System

There are several problems occurs in gastrointestinal tract (GI tract) such as drug reaction, direct injury, mucosal integrity disorder, or due to colonic microbiota infection. Most of drug that affects GI tract is non-steroidal anti-inflammatory drugs (Fernandes & Norman, 2019).

This point describe you about several drug to treat problem related bowel (Aggarwal & Bhatt, 2014).

Table 2.6 Drug commonly used at gastrointestinal tract

Drug's classification	Commonly prescribed	Pharmacokinetics and pharmacodynamics	Indication	Nursing concern/ adverse event
Antiemetics	Chlorpromazine, prochlorperazine, promethazine, metolropramide, ondansetron, granisetron, tropisetron, dolasetron.	Antiemetic agents bind to the receptors in the vomiting center of the brain stem and block their signaling pathways	Reducing nausea and vomiting	Headache, dizziness, extrapyramidal syndromes
Laxatives	Stimultan laxatives such as bisacodyl, sodium picosulfate; and osmotic laxative like magnesium salts.	Bulk-forming: increase the bulk of stools Osmotic laxatives: increasing the amount of fluid Stimulant: stimulate the nerves to move faeces Stool: wetting and softening the faeces.	To treat constipations	Headache, dizziness, extrapyramidal syndromes

Pharmacology of Nervous System

Autonomic Drugs

The receptors that autonomic medicines activate or block are used to categorize them. The sympathetic and parasympathetic nervous systems have opposing effects, autonomic medicines are categorized according to one of four probable actions that are sympathetic nervous system stimulation; parasympathetic nervous system stimulation; the sympathetic nervous system's inhibition; a parasympathetic nerve system inhibitor (M. Adams & Urban, 2019).

Cholinergic Agonist

Drugs can activate cholinergic receptors either directly or indirectly. Cholinergic receptors are located throughout the peripheral nervous system. The autonomic nerve system contains neuroeffector junctions in the parasympathetic division and the ganglia in both the parasympathetic and sympathetic divisions. In the somatic nervous system, there are at the neuromuscular junctions, which result in skeletal muscle contraction (M. P. Adams et al., 2017; M. Adams & Urban, 2019)

Cholinergic Antagonists

Cholinergic antagonists act by blocking the effects of acetylcholine at muscarinic or nicotinic receptors. This results in two primary classes of cholinergic antagonists that is muscarinic and nicotinic. Muscarinic block receptors at cholinergic synapses in the parasympathetic nervous system and at a few target organs in the sympathetic nervous system. Nicotinic are block receptors at cholinergic synapses in the

ganglia or in the somatic nervous system at the neuromuscular junction (M. P. Adams et al., 2017; Paul, 2019).

Adrenergic Agonists

Adrenergic agonists activate the sympathetic nervous system to produce fight-or-flight symptoms. Adrenergic agonists, also called sympathomimetics, are agents that activate adrenergic receptors in the sympathetic nervous system. Drugs in this class include naturally occurring (endogenous) substances such as norepinephrine (NE), epinephrine, and dopamine. Adrenergic agonists may act directly by binding to adrenergic receptors, or indirectly by increasing the amount of norepinephrine at synapses. Adrenergic agonists may be classified as catecholamines or noncatecholamines (M. P. Adams et al., 2017; M. Adams & Urban, 2019).

Adrenergic Antagonists

Adrenergic antagonists inhibit the sympathetic nervous system and produce many of the same rest-and-digest symptoms as the cholinergic agonists. They have wide therapeutic applications in the management of hypertension (HTN), angina pectoris, myocardial infarction, and heart failure (HF). They also serve limited roles in the pharmacotherapy of benign prostatic hyperplasia, thyroid crisis, and glaucoma. Adrenergic antagonists act by blocking the effects of norepinephrine at adrenergic receptors. Alpha1-adrenergic antagonists are used to treat hypertension and benign prostatic hyperplasia (M. Adams & Urban, 2019; American Cancer Society, 2022; Paul, 2019).

Alpha-adrenergic receptors are primarily located on smooth muscle, and their activation results in contraction. Most blood vessels, including those serving the myocardium, genitourinary (GU) system, gastrointestinal (GI) system, and brain, have alpha receptors. Because of their key locations on arterial smooth muscle, the most important effects of alpha-adrenergic antagonists, or alpha blockers, are on the cardiovascular system. Blockade of alpha receptors will dilate blood vessels, thus lowering blood pressure (M. Adams & Urban, 2019).

Beta-Adrenergic Antagonists affect both beta1 and beta2 receptors and are prescribed for HTN, angina, and other cardiovascular disorders. Beta-adrenergic antagonists, or beta blockers, are classified as nonselective or selective. Nonselective beta-adrenergic antagonists, such as propranolol, block both beta1 and beta2 receptors. Selective drugs that block only beta1 receptors are sometimes called cardio-selective agents (M. P. Adams et al., 2017).

SUMMARY

There are several drugs commonly used in our body such as:

1. Drug used in cardiovascular system consist of anticoagulant, antiplatelet, angiotensin II receptor blockers, digitalis preparations, diuretics, and vasodilators.
2. Drug used in immune system such as immunomodulators and immunosuppressant
3. Drug used in respiratory system like respiratory stimulants, inhaled corticosteroids, beta agonists, cholinergic antagonists, and methylxanthines

4. Drug used in endocrine system such as thyroid drug, insulins and non-insulins drugs
5. Drug used in gastrointestinal system like antiemetics and laxatives.
6. Drug used in nerve systems like norepinephrine, epinephrine and dopamine.

FORMATIVE TEST

Please answer the questions below!

1. Mention the drug commonly used in cardiovascular, immune, respiratory, endocrine, gastrointestinal and nervous system.
2. What is the adverse effect of the drugs and give an example related this condition?

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UNIT 3.

THE ROLE OF NURSES OF DRUG ADMINISTRATION

LEARNING OBJECTIVES

Please read carefully the learning objective of this topic.
After you learn this topic, you will be able to analyze the roles of nurse on drug administration

OUTLINE

- ❖ Legal and ethical consideration
- ❖ The role of nurses
- ❖ Code of ethic for nurses
- ❖ Nurse practitioner using medication assisted treatment (MAT)
- ❖ Key role for nurses preventing and managing adverse drug effects
- ❖ Allergic Reaction are caused by a hyper-response of the immune system
- ❖ Drugs may have cancer high risk and birth defects
- ❖ Drug toxicity may be specific to particular organs

Legal and Ethical Consideration

One of the most important duties nurses have while caring for patients is giving medications. Safe medicine administration, however, involves many members of the healthcare team as well as moral, legal, social, and cultural considerations. It is not only a nursing responsibility. Patient safety is the main priority for all healthcare workers when administering medications effectively. Despite numerous efforts over the last few decades to improve patient safety, pharmaceutical mistakes and side effects are nevertheless frequent occurrences. According to the World Health Organization (WHO), pharmaceutical mistakes

and unsafe pharmaceutical practices are the main causes of injury and preventable damage in health care systems across the world. The cost of drug mistakes has been assessed on a global scale (Ernstmeyer and Christman 2023).

Role of Nurses

In medication stewardship, nurses indicated a willingness to participate actively and saw this as an extension of their advocacy for patients. First, by challenging the medical need of urine cultures, nurses may play a significant part in drug stewardship. The next is nurses may ensure proper techniques when collecting a culture. The third, nurses may obtain and recording an accurate drug history especially antibiotic. Then, nurses may have a role encouraging the prompt transition from IV to PO drugs. The last is nurses may initiating the drug timeout (Carter et al. 2018).

Code of Ethics for Nurses

The 4 million registered nurses in the country are represented by the American Nurses Association (ANA), a professional organization that is leading the charge to raise the standard of healthcare for everyone. The ANA created the Code of Ethics for Nurses as a manual for performing nursing duties in a way that is compatible with the ethical requirements of the profession and the quality of nursing care. The Code of Ethics has several regulations that have an influence on how nurses should ethically deliver drugs (American Nurses Association 2017). Below is a synopsis of each section of the Code of Ethics and how it relates to the administration of medicine.

- ❖ The nurse treats patients with empathy and respect for their intrinsic value and distinctive qualities.
- ❖ The patient is the nurse's first and foremost priority.
- ❖ The nurse upholds the patient's rights and defends their health and safety.
- ❖ Concerns the power, accountability, and duty of a nurse to adhere to legal regulations, including national and state standards of care. Encompasses the nurse's duty to advance health and security.
- ❖ Nurses are expected to exercise clinical judgment and refrain from acting in a beneficent or malevolent manner toward patients. Focuses on a nurse using their professional judgment in accordance with the criteria provided by professional nursing organizations and the state nurse practice statute.
- ❖ Emphasizes that a nurse must deal with issues including poverty, education, access to safe medicine, and healthcare inequities.

Nurse Practitioner using Medication-Assisted Treatment (MAT)

MAT is an evidence-based approach to addiction treatment that uses medication, integrated with counseling and other behavioral therapies to provide holistic, patient-centered care. MAT is widely recognized as the most effective care for patient with cases. On the other hand, MAT improves patient survival rates and offers many other harm reduction benefits. Patients stay in treatment longer than with abstinence-based treatment programs. MAT decreases illicit opioid use and associated criminal activity in people with substance abuse disorder. MAT

reduces the chances of contracting human immunodeficiency virus, hepatitis C, or an abscess from contaminated needle injections. Patients are able to lead more stable lives with MAT because they are not experiencing the ups and downs of withdrawal and the anxiety and danger when searching for their next fix (Moore 2019).

Key Role for Nurses Preventing and Managing Adverse Drug Effects

Despite the possibility of side effects from any medicine, the majority of pharmacotherapy may be carried out without causing noticeable negative effects. In fact, throughout the medication research and licensing process, pharmaceuticals that cause severe side effects are screened and eliminated from consideration or are limited for treating critical medical disorders like cancer. When used as prescribed, patients anticipate that their prescriptions, including over-the-counter (OTC) medicines, herbal remedies, and nutritional supplements, won't have any severe side effects. Although most medications are quite safe, side effects cannot always be completely prevented (Adams and Urban 2019).

Even at therapeutic dosages, certain medication effects, known as side effects, may still manifest. When compared to undesirable consequences, side effects are less severe. Patients are frequently prepared to put up with bothersome side effects if they think the medication will help them feel better or prevent them from getting sick. However, it's not always evident how to tell an impact from a side effect. Is a headache, for instance, a side effect or a negative impact? How about sickness? The intensity of the symptoms holds the key

to the solution. Headache or nausea may be insignificant (side effects) or severe and incapacitating (adverse effects) (Adams and Urban 2019).

According to Adam and Urban (2019), adverse medication events might impact different organ systems or only one kind of tissue. Serious nausea and vomiting are the most frequent side reactions, and they can happen regardless of how medications are delivered. Adverse medication events include a bad headache and major changes in blood pressure are also rather typical. Even though they are uncommon, certain side effects are severe enough to demand routine or ongoing monitoring. Serious occurrences include the loss of eyesight or hearing, or the damage or failure of whole organs like the heart, liver, or kidneys. Additional uncommon adverse drug events linked to certain medications include anaphylaxis, Stevens-Johnson syndrome (SJS), malignancy, and birth abnormalities. Serious drug is defined by the U.S. Food and Drug Administration (FDA).

Many side effects are pharmacologic activities of a medicine that have been extended. These events are regarded as dose-dependent: The danger of side effects grows as medicine dosage rises as well. Antihypertensive medications, for instance, are used to reduce blood pressure, but large dosages might result in hypotension, which can induce lightheadedness or fainting. Higher dosages of drugs used to treat anxiety or sleeplessness may too severely slow down brain activity, causing drowsiness or daytime sedation. The nurse can anticipate the signs and symptoms of many of the side effects that develop during therapy by being aware of the therapeutic activities of the medicine. It’s critical for nurses and their patients to comprehend that a drug’s potential for being

a helpful medication or a harmful chemical might vary greatly (Adams and Urban 2019).

Is it possible to stop negative effects? Although nurses are crucial in reducing the frequency and severity of adverse events in their patients, certain adverse effects are inescapably unpredictable and unavoidable. However, knowledgeable healthcare professionals have several options for minimizing or preventing side effects, from having in-depth understanding of a drug's mechanism of action to asking their patients for a thorough medical history. The following are strategies used by nurses to lessen or stop adverse medication reactions in their patients (Adams and Urban 2019). The following are means that nurses use to minimize or prevent adverse drug events in their patients:

- Compile a complete medical history. Drug allergies or other problems that exclude the use of specific medications may be revealed by the patient's medical history.
- Completely evaluate the patient and any diagnostic information. An evaluation may identify underlying renal or hepatic dysfunction that will alter how the body processes a medicine.
- Avoid pharmaceutical mistakes. Unnecessary side effects might result from administering the medicine at the improper dose or to the wrong patient.
- Pharmacotherapy should be closely monitored. After initial medication dosages or when doses are raised, patient signs and symptoms should be periodically monitored.
- Be familiar with the medications. Knowing the most prevalent and severe side effects of any medicine given is crucial for nurses.

- ❖ Be ready for the unexpected. Anaphylaxis can happen suddenly and without warning.
- ❖ Inquire about strange orders. The medicine should not be provided until the doctor or pharmacy has been notified if the nurse thinks that the improper dose was prescribed or the pharmacist filled the prescription erroneously.
- ❖ Inform patients of negative consequences. In recognizing and averting negative consequences, the patient is the nurse's ally.

Allergic Reaction are Caused by a Hyper-response of the Immune System

Medication allergies are a frequent occurrence, accounting for 6% to 10% of all negative medication reactions. Drug allergies can induce a wide variety of symptoms in patients, but every one of them is brought on by an overreaction of the body's defenses. A medication allergy is defined by a number of factors. Very modest doses of drugs can cause allergies; the intensity of allergy symptoms frequently does not correlate with dosage. Anaphylaxis has the same symptoms regardless of the substance that causes it, and allergic symptoms are independent to the pharmacologic effects of the drug. Cross-allergy, an allergic response to medications with a similar structure, such as those in the same pharmacologic class, is frequently seen in patients (Adams and Urban 2019).

Drug allergies can cause a variety of signs and symptoms, from minor to potentially fatal. The onset of symptoms might happen minutes after the medicine is taken or they can take time to manifest throughout pharmacotherapy. When a patient is taking many drugs, it might be challenging to link an allergy

symptom to a particular drug since the signs and symptoms of drug allergy are vague (Adams and Urban 2019).

Most medications have the risk of allergic reactions, but some carry a larger risk than others. The drugs that are most likely to result in allergic reactions are penicillins and related antibiotics (monobactams and cephalosporins); radiologic contrast media containing iodine; insulin; nonsteroidal anti-inflammatory drugs (NSAIDs), including aspirin; sulfonamides; cancer chemotherapy drugs; preservatives (sulfites and paraben); and specific antiseizure medications. The nurse should closely monitor patients receiving biologics like monoclonal antibodies since they have been demonstrated to induce a high incidence of allergic responses. The usage of biologics like these has significantly expanded in recent years (Adams, Holland, and Urban, 2017; Adams and Urban 2019).

Patients frequently misidentify any negative side effect as a medication allergy because they are uninformed of what an allergy actually is. For instance, many patients will disclose a codeine allergy during a medication history when taking narcotic analgesics like codeine because they experience extreme nausea and vomiting. The truth is that these symptoms are not an allergy since they are not brought on by an overactive immune system (Adams and Urban 2019; Paul 2019).

A patient's unique genetic makeup frequently contributes to idiosyncratic medication reactions. A pharmacological side effect known as an idiosyncratic reaction causes peculiar and unexpected symptoms that are unrelated to the pharmacologic activity of the medicine. Since idiosyncratic responses are not immune-related, they are not categorized as allergies. They are

uncommon, surprising, and distinct for each patient (Adams and Urban 2019).

Drugs May Have Cancer High Risk and Birth Defects

The majority of side effects appear minutes or hours after a medicine is taken; a few only appear days or weeks into pharmacotherapy. Occasionally, the side effect may manifest years or even decades after the medicine was used. Drug-induced cancer falls within this category. Only a small number of the hundreds of medications and drug combinations that have been licensed for use in pharmacotherapy raise the risk of developing cancer(Adams and Urban 2019; Stringer 2011). Table 1 mention the classification of the drug agents.

Table 3.1 Selected drugs suspected of causing cancer in humans

Class	Drug	Type of Cancer
Antineoplastic	chlorambucil cisplatin cyclophosphamide dacarbazine doxorubicin etoposide metronidazole nitrosoureas phenytoin propylthiouracil teniposide	Leukemia, urinary bladder
Hormones and hormone antagonists	anabolic steroids estrogen replacement therapy and oral contraceptives progesterone tamoxifen	Uterus, breast, hepatic
Immunosuppressants	azathioprine cyclosporine	Lymphoma, skin

Hormones or hormone antagonists make up the third category of substances that may cause cancer. There is still much to learn about the processes by which hormonal

imbalances cause cancer, and research on the issue is ongoing. Sometimes a patient is protected against cancer by hormones, or hormones may lower the risk of one form of cancer while raising the chance of another. How estrogen attaches to its intracellular receptors is likely the most well researched hormone binding mechanism. The estrogen receptor (ER) is present in about 70% of breast cancer patients: In the mammary gland, the hormone encourages tumor growth. Reproductive organs including the vagina, uterus, or breast are frequently affected by cancers brought on by hormones or hormone antagonists (Adams and Urban 2019).

Regarding teratogens, or medications that cause birth deformities, a similar query may be posed. If a medicine was shown to cause birth deformities in lab animals during the preclinical stage of drug research, why would the FDA approve it? When compared to the response to the question about cancer-causing medications, this one is considerably different (Adams and Urban 2019).

Those who are pregnant or become pregnant while receiving medication are the majority of people who are affected by teratogens. Most of the time, both men and postmenopausal women can safely utilize these medications. As a result, known teratogens may be allowed for use in people who are not likely to get pregnant. For instance, the teratogen finasteride (Proscar) is only permitted for the treatment of males with benign prostatic hyperplasia (Adams et al. 2023, 2017).

Drug Toxicity May be Specific to Particular Organs

Few medications have negative effects in every organ system, according to Adam and Urban, who also noted that

these medications would be too toxic for safe pharmacotherapy. Instead, negative effects frequently target a single organ or a small number of organs. To properly monitor the right signs, symptoms, and diagnostic tests, the nurse must be aware of these specific toxicities. There would be an explanation of specific medication toxicity (Adams and Urban 2019; Burchum, Rosenthal, and Lehne 2019).

Drugs that influence the bone marrow are extremely dangerous since they might have catastrophic, perhaps deadly, effects. Red, white, and platelet cell development takes place in the bone marrow, which also functions as a nursery. Only one of these cell types may be impacted by drugs, or all three. Drug-induced pancytopenia or aplastic anemia happens when all three groups are afflicted, and the patient is at a high risk for developing serious sickness. In order to avoid bone marrow toxicity, nurses must closely monitor laboratory results and identify approaching toxicity by reporting drops in red blood cells, white blood cells, or platelets. If the problem is identified early and treated rapidly, bone marrow poisoning can frequently be reversed (Coleman and Pontefract 2016; Fernandes and Norman 2019).

Cardiotoxicity: Some drugs harm the heart's capacity to pump blood to the tissues by damaging the heart's cardiac muscle cells. Acute left ventricular failure, bradycardia, tachycardia, heart failure, and severe cardiotoxicity can all be caused by these medications. When delivering cardiotoxic medications, the nurse must be careful in looking out for symptoms of cardiotoxicity, such as extreme weariness, coughing, shortness of breath (particularly when lying down),

weight gain, or peripheral edema (American Heart Association 2023; Coleman and Pontefract 2016).

Dermatologic toxicity: Among the most frequent forms of negative effects are drug responses that have an impact on the skin. Hypersensitivity reactions or nonimmune-type responses may be to blame for these reactions. Before determining the source of the skin issue, the nurse should stop the medicine (Adams and Urban 2019; Coleman and Pontefract 2016).

Hepatotoxicity: Through the hepatic portal vein, all medications that pass the mucosa of the stomach and intestine are delivered to the liver. It should not be surprised that hepatotoxicity is one of the most prevalent adverse medication effects since the liver plays a crucial role in the metabolism and detoxification of medicines and other substances that enter the body. When giving hepatotoxic medications, the nurse should periodically check the results of liver enzyme testing since changes in these lab results are early indicators of liver damage (Fernandes and Norman 2019; Gimenez-Bastida et al. 2018).

Nephrotoxicity: One of the organs most frequently harmed by medications is the kidneys. This is so because enormous amounts of blood are filtered by these organs, and the majority of medicines are eliminated by the kidneys. When certain medications are reabsorbed or released by the kidney, renal tubule cells are exposed to high amounts of these substances. Some cause crystalluria in the urinary tract, which blocks the urinary system. Drug nephrotoxicity may present as immediate, acute symptoms following one or more doses, or as long-lasting, chronic symptoms following several months of pharmacotherapy. Nephrotoxic medications should not be administered to patients with severe renal impairment until all

other treatment alternatives have been tried first (Adams and Urban 2019).

Despite the fact that many medications cannot cross the blood-brain barrier and reach the brain, neurotoxicity is a very prevalent side effect of several drug groups. This is so because small doses of hazardous compounds can have a particularly negative effect on the brain, which gets a significant portion of the blood supply. The difference between a therapeutic dose and one that causes side effects may be quite tiny for sedatives, antidepressants, antianxiety medications, antiseizure medications, and antipsychotics. Depression, mania, sedation, behavioral changes, suicidal thoughts, hallucinations, and seizures are indications of central nervous system (CNS) poisoning. It is possible that the particular senses will be impacted, including hearing loss, balance issues, and visual alterations. Drug-related eighth cranial nerve injury, often known as ototoxicity, can cause hearing loss. The nurse has to be informed that using neurotoxic medications might considerably exacerbate existing mental health conditions. Serious symptoms including seizures, delirium, suicidal thoughts, or severe visual or auditory impairment should be reported to the physician right away (Adams and Urban 2019; Coleman and Pontefract 2016).

Skeletal muscle and tendon toxicity: Despite having a large blood supply, skeletal muscle is remarkably resistant to the effects of medicines. Drug-induced myopathy in skeletal muscle occurs seldom, but when it does, it can have catastrophic consequences. Rhabdomyolysis, which is characterized by widespread muscular necrosis and the release of muscle enzymes and other components into the bloodstream, is the most severe form of myopathy. The nurse should monitor any

unexplained muscle or joint discomfort or pain throughout therapy to prevent skeletal muscle or tendon toxicity. When using medicines that have muscle toxicity, routine evaluation of laboratory tests such creatine kinase (CK) is advised (Adams et al. 2017).

SUMMARY

1. Nurses play crucial role in administering medications, involving healthcare team members, moral, legal, social, and cultural considerations.
2. The American Nurses Association (ANA) represents 4 million registered nurses, promoting healthcare excellence through the Code of Ethics for Nurses, ensuring ethical performance and quality care.
3. MAT is evidence-based, holistic addiction treatment combining medication, counseling, and behavioral therapies.
4. Most pharmacotherapy avoids severe side effects, limiting treatment for critical medical disorders.
5. Medication allergies are common, affecting 6%-10% of negative reactions, causing various symptoms due to overreaction of the body's defenses. They are influenced by modest doses and cross-allergy.

FORMATIVE TEST

Please answer the questions below!

1. Describe the role of nurses toward drug administration.
2. Describe how important drug administer providing by nurses and its relation with nursing role

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UNIT 4.

PATIENT SAFETY IN DRUG ADMINISTRATION

LEARNING OBJECTIVES

After you finish this material, you can analyze and demonstrate drug administer safely

OUTLINE

- ❖ Overview patient safety in drug administration
- ❖ Strength of issue
- ❖ The general goal
- ❖ Fundamental problem of strategic framework issues
- ❖ Patient safety culture
- ❖ Right principles of drug administration

Overview Patient Safety in Drug Administration

The third global patient safety challenge from the World Health Organization (WHO) seeks to reduce the incidence of medication-related damage globally by 50% within five years. The goal is to duplicate the global effect and reach of the two previous global patient safety challenges: safe surgery saves lives and clean care is safer care. The third challenge, medication without harm, challenges health ministers to launch national plans addressing four areas of medication safety: patient and public involvement; medication as a product; education, training, and oversight of healthcare professionals; and systems and practices of medication management. The WHO is also obligated by this challenge to use its convening and coordinating abilities to further a number of international initiatives on pharmaceutical safety. Similar to how hand hygiene and the surgical checklist were selected as the flagships of the first two challenges, there are three priority drug safety areas

that have the most impact on patients. High-risk circumstances, polypharmacy, and care transitions are these three categories. Each region has a heavy load of risk for injury, therefore if handled well, it might lower the risk of harm for many people (Sheikh et al., 2017).

At some time in their lives, everyone in the globe will take medications to either prevent or treat sickness. Our ability to cope with illness has been eternally changed by medicine, which has also typically extended our lives. Nevertheless, taking medications inappropriately, being monitored insufficiently, or as the consequence of a mistake, accident, or communication issue can occasionally result in substantial injury (World Health Organization, 2017). The absence of leadership supervision, a lack of human resources, nursing turnover, a lack of a standard procedure for applying the correct principle when administering medication, a lack of a nursing training program, and a lack of socialization are all factors that affect the application of patient safety when administering medication (Tampubolon & Pujiyanto, 2018).

Strength of the Issue

In health care systems all throughout the world, unsafe pharmaceutical practices and medication mistakes are a major source of unnecessary injury, included:

1. Low-, middle-, and high-income nations experience this damage to varying degrees and in different ways.
2. The yearly cost of drug mistakes is estimated to be 42 billion US dollars worldwide.
3. Compared to patients in high-income nations, patients in low-income countries lose twice as many years of life

owing to medication-related damage in terms of disability-adjusted life expectancy.

4. Drug mistakes can cause serious injury, incapacity, or even death when inadequate drug systems and/or human factors like exhaustion, unfavorable working circumstances, or a lack of employees have an impact on prescribing, transcribing, dispensing, administering, and monitoring procedures.
5. The majority of mistakes are made when administering medication, although there are dangers at all phases of the procedure (World Health Organization, 2017).

The General Goal

By enhancing the mechanisms for lowering pharmaceutical mistakes and preventable drug-related damage, the Global Patient Safety Challenge on pharmaceutical Safety aims to increase medication safety. The third key area is minimizing medication-related damage in the context of care transitions. When patients move between care settings (for example, from primary to hospital care) or between care providers within the same setting (for example, from out-patient respiratory to out-patient cardiovascular clinics), failure to effectively communicate information on medications and/or underlying risk factors may result in medication errors (Sheikh et al., 2017).

Fundamental Problem of Strategic Framework Issues

Measurement and safety monitoring mechanisms should be strengthened, and the Strategic Framework for this Challenge should energize commitment to lowering pharmaceutical

mistakes and medication-related damage (World Health Organization, 2017).

The strategy framework is built on four core issues:

1. Patients and the general population occasionally misuse medications. They are all too frequently treated as the passive recipients of medications, not given the information or authority to take an active role in making the administration of medications safer.
2. Sometimes, the names or packaging of medicines might be confusing or complex, and there may not always be enough or clear information. 'Look-alike soundalike' pharmaceutical names, labeling, and packaging are common sources of mistake and medication-related injury that may be remedied.
3. Sometimes, medical practitioners will prescribe and deliver medications in ways and situations that raise the risk of patient damage.
4. Medication systems and practices are complicated and frequently dysfunctional, but with proper comprehension and design, they may be made more resistant to risk and damage (World Health Organization, 2017).

Patient Safety Culture

Research in Sweden reported that teamwork among units and a nonpunitive response to mistakes received the greatest ratings for cultural characteristics, while staffing and managerial support for patient safety received the lowest ratings. Long professional experience (>15 years) was linked to a higher likelihood of high patient safety overall, according to the multivariate analysis. The likelihood of high patient

safety overall was greater for emergency treatment but lower for mental care as compared to regular wards. Physicians and enrolled nurses had a greater likelihood of high overall patient safety compared to managers (Danielsson et al., 2019).

Right Principles of Drugs Administration

Nurses have a unique role and responsibility in medication administration because they are frequently the last individual to verify that the medication has been correctly prescribed and dispensed prior to administration. The ‘five rights’ or ‘five R’s’ of medication administration are commonly taught during nursing school. These ‘rights’ arose during a time in medicine when the norm was that a provider was solely responsible for an error and patients were not as involved in their own care (Adams et al., 2017; Hanson & Haddad, 2023; Macdonald, 2010)2010.

Hanson and Haddad (2023)in that they are frequently the final person to check to see that the medication is correctly prescribed and dispensed before administration. It is standard during nursing education to receive instruction on a guide to clinical medication administration and upholding patient safety known as the ‘five rights’ or ‘five R’s’ of medication administration. These ‘rights’ came into being during an era in medicine in which the precedent was that an error committed by a provider was that provider’s sole responsibility and patients did not have as much involvement in their own care.”,”call-number”:”NBK560654”,”container-title”:”StatPearls”,”event-place”:”Treasure Island (FL described there are five several right principles of drug administration done by nurses during drug administration. These are right principles:

1. Right patient

Confirming that the patient being treated is the intended recipient of the prescribed medication. This is best accomplished by nurses explicitly requesting a patient to state his or her full name aloud and, if applicable, comparing the name and ID number on medical wristbands to those on the patient's chart. If there are two or more patients with identical or similar names in a facility, it is prudent not to address patients by their first or last name alone. Depending on the unit a patient is in, some patients, such as psychiatric patients, may not wear wristbands or may be unable to accurately identify themselves due to mental impairment. In such situations, nurses are advised to confirm a patient's identity using alternative methods with the appropriate degree of diligence.

2. Right drug

Confirming that the medication to be administered corresponds to the prescribed substance. Some brand names and generic names may share a comparable orthography or pronunciation due to a shared prefix, suffix, or initial letter. As an example, all beta-blocker drugs ended by word '-lol' to imply their mechanism of action. It is essential to distinguish between two medications with similar names because the two medicines in issue may have significantly different mechanisms of action or prescribing indications. Except for nurse practitioners, who are qualified to prescribe certain medications in limited circumstances, nurses are not authorized to prescribe pharmaceuticals (Adams et al., 2017; Martyn et al., 2019).

3. Right route

In accordance with the mode of administration, the rate of chemical absorption, the duration of the drug's effects, and the likelihood of adverse effects vary. Oral, intramuscular, intravenous, topical, and subcutaneous injections are common administration routes. Medication administration has become more complicated in modern medicine due to the development of pharmaceuticals that can be administered via novel routes, such as central venous catheters, patient-controlled analgesia (PCA), epidural infusions, and intrathecal administration (Macdonald, 2010)2010.

4. Right time

Administering medications according to the prescriber's instructions. Frequently, certain medications have specific intervals or dosing windows during which another dose must be administered to maintain therapeutic effect or level. A guiding principle of this 'right' is that medications should be prescribed as close to the time as feasible, and nurses should not deviate from this time by more than a half-hour to avoid consequences such as bioavailability changes and other chemical mechanisms.

5. Right dose

Incorrect dosage, conversion of units, and incorrect substance concentration are prevalent modalities of medication administration error. This error type stems from nurses giving a patient an incorrect dose of medications, even if it is the correct medication and the patient's identity is verified, without first checking to ensure it is the correct strength for the patient. This may be due to misplaced decimals, errors in arithmetic,

or incorrect conversion between two units. For example, a misplaced decimal point can impact the dose of medication by 10-fold, just as micrograms and milligrams may easily be mistaken with a quick, incorrect glance at unit abbreviations like mcg versus mg (Martyn et al., 2019).

SUMMARY

1. National plans for medication safety address patient involvement, product safety, professional education, and management practices.
2. Unsafe pharmaceutical practices and medication mistakes cause unnecessary injury in healthcare systems worldwide
3. The Global Patient Safety Challenge aims to improve medication safety and minimize medication-related damage during care transitions.
4. The strategy framework addresses four core issues: patients' misuse of medications, confusing names and packaging, medical practitioners' risky prescribing, and complex systems that can be improved through understanding and design.
5. Result of the study show that teamwork, nonpunitive response to mistakes, long professional experience, emergency treatment, and physicians and nurses are key factors for high patient safety.
6. There are five right principle of drug administer consist of right patient, right drug, right route, right time and right dose.

FORMATIVE TEST

Please answer the questions below!

1. What is the general objective of improving medication safety?
2. Describe right principle of drug administer!

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GLOSSARY

Pharmacology	:	the study of medicines and drugs, including their action, their use, and their effects on the body
Drug	:	any natural or artificially made chemical that is used as a medicine

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