# Pharmacology for Nurses

Sixth Edition

# Pharmacology for Nurses

## A Pathophysiologic Approach

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Dr. Adams obtained his master's degree in pharmacology from Michigan State University and his doctorate in education from the University of South Florida. Dr. Adams was on the faculty of Lansing Community College and St. Petersburg College, and served as Dean of Health Professions at Pasco-Hernando State College for 15 years. He is currently Adjunct Professor of Biological Sciences at Hillsborough Community College.

*I dedicate this book to nursing educators, who contribute every day to making the world a better and more caring place.*

—MPA

**LELAND NORMAN HOLLAND, JR., PHD (NORM),** over 25 years ago, started out like many scientists, planning for a career in basic science research. He was quickly drawn to the field of teaching in higher medical education, where he has spent most of his career. Among the areas where he has been particularly effective are preparatory programs in nursing, medicine, dentistry, pharmacy, and allied health. Dr. Holland is both a professor and supporter in nursing education nationwide. He brings to the profession a depth of knowledge in biology, chemistry, and medically related subjects, such as microbiology, biological chemistry, and pharmacology. Dr. Holland's doctoral degree is in medical pharmacology. He is very much dedicated to the success of students and their preparation for careers in health care. He continues to motivate students in the lifelong pursuit of learning.

*To the greatest family in the world: Karen, Alexandria, Caleb, and Joshua.*

—LNHII

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*To my daughter, Joy, an extraordinary pediatric hematology-oncology nurse, and in memory of my son, Keith, and husband, Michael.*

—CQU

# Thank You

Our heartfelt thanks go out to our colleagues from schools of nursing across the country who have given their time generously to help create this exciting new edition. These individuals helped us plan and shape our book and resources by reviewing chapters, art, design, and more. *Pharmacology for Nurses: A Pathophysiologic Approach*, sixth edition, has reaped the benefit of your collective knowledge and experience as nurses and teachers, and we have improved the materials due to your efforts, suggestions, objections, endorsements, and inspiration. Among those who gave their time generously are the following:

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# Preface

When students are asked which subject in their nursing program is the most challenging, pharmacology always appears near the top of the list. The study of pharmacology demands that students apply knowledge from a wide variety of the natural and applied sciences. Successfully predicting drug action requires a thorough knowledge of anatomy, physiology, chemistry, and pathology as well as the social sciences of psychology and sociology. Lack of adequate pharmacology knowledge can result in immediate and direct harm to the patient; thus, the stakes in learning the subject are high.

Pharmacology cannot be made easy, but it can be made understandable when the proper connections are made to knowledge learned in these other disciplines. The vast majority of drugs in clinical practice are prescribed for specific diseases, yet many pharmacology textbooks fail to recognize the complex interrelationships between pharmacology and pathophysiology. When drugs are learned in isolation from their associated diseases or conditions, students have difficulty connecting pharmacotherapy to therapeutic goals and patient wellness. The pathophysiology focus of this textbook gives the student a clearer picture of the importance of pharmacology to disease and, ultimately, to patient care. The approach and rationale of this textbook focus on a holistic perspective to patient care which clearly shows the benefits and limitations of pharmacotherapy in curing or preventing illness. In addition to its pathophysiology focus, medication safety and interdisciplinary teamwork are consistently emphasized throughout the text. Although difficult and challenging, the study of pharmacology is truly a fascinating, lifelong journey.

## New to This Edition

The sixth edition of *Pharmacology for Nurses: A Pathophysiologic Approach* has been thoroughly updated to reflect current pharmacotherapeutics and advances in understanding disease.

- **NEW!** Applying Research to Nursing Practice feature illustrates how current medical research is used to improve patient teaching. Books, journals, or websites may be cited, and the complete source information provided in the References section at the end of the chapter.
- **NEW!** Key terms are listed at the beginning of each chapter along with corresponding page numbers that indicate where their definitions may be found within the chapter.
- **UPDATED!** Check Your Understanding questions appear throughout the drug chapters to reinforce student knowledge.
- **EXPANDED!** Includes more than 40 new drugs, drug classes, indications, and therapies that have been approved since the last edition.
- **UPDATED!** Black Box Warnings issued by the FDA are included for all appropriate drug prototypes.
- **UPDATED!** Pharmacotherapy Illustrated diagrams help students visualize the connection between pharmacology and the patient.
- **UPDATED!** Nursing Practice Application charts have been revised to contain current applications to clinical practice with key lifespan, safety, collaboration, and diversity considerations noted.

## Organization and Structure—A Body System and Disease Approach

*Pharmacology for Nurses: A Pathophysiologic Approach* is organized according to body systems (units) and diseases (chapters). Each chapter provides the complete information on the drug classifications used to treat the diseases. Specially designed numbered headings describe key concepts and cue students to each drug classification discussion.

The pathophysiologic approach clearly places the drugs in context with how they are used therapeutically. The student is able to locate easily all relevant anatomy, physiology, pathology, and pharmacology in the same chapter in which the drugs are discussed. This approach provides the student with a clear view of the connection among pharmacology, pathophysiology, and the nursing care learned in other clinical courses.

The vast number of drugs available in clinical practice is staggering. To facilitate learning, this text uses drug prototypes in which the most representative drugs in each classification are introduced in detail. Students are less intimidated when they can focus their learning on one representative drug in each class.

This text uses several strategies to connect pharmacology to nursing practice. Throughout the text the student will find interesting features, such as Complementary and Alternative Therapies, Treating the Diverse Patient, Community-Oriented Practice, and Lifespan Considerations, that clearly place the drugs in context with their clinical applications. Applying Research to Nursing Practice features illustrate how current medical research is used to improve patient teaching. Patient Safety illustrates potential pitfalls that can lead to medication errors. PharmFacts contain statistics and facts that are relevant to the chapter. Check Your Understanding features encourage students to apply what they have already read in the chapter.

Students learn better when supplied with accurate, attractive graphics and rich media resources. *Pharmacology for Nurses: A Pathophysiologic Approach* contains a generous number of figures, with an unequaled art program. Pharmacotherapy Illustrated features appear throughout the text, breaking down complex topics into easily understood formats. Animations of drug mechanisms show the student step-by-step how drugs act.

**Prototype Drug** | Valproic Acid *(Depakene, others)*

**Therapeutic Class:** Antiseizure drug **Pharmacologic Class:** Valproate

**Actions and Uses**

Valproic acid has become a preferred drug for treating many types of epilepsy. This medication has several trade names and formulations, which can cause confusion when studying it.

- Valproic acid (Depakene) is the standard form of the drug given PO.
- Valproate sodium (Depacon) is the sodium salt of valproic acid given PO or IV.
- Divalproex sodium (Depakote ER) is a sustained release combination of valproic acid and its sodium salt in a 1:1 mixture. It is given PO and is available in an enteric-coated form.

All three formulations of the drug form the chemical ***valproate*** after absorption or on entering the brain. The pharmacokinetics of each form varies, and doses are not interchangeable. In this text, the name ***valproic acid*** is used to describe all forms of the drug, unless specifically stated otherwise.

Valproic acid is administered as monotherapy or in combination with other AEDs to treat absence seizures and complex partial seizures. Depakote ER is also approved for the prevention of migraine headaches and mania associated with bipolar disorder. Off-label indications include severe behavioral disturbances, such as agitation due to dementia, Alzheimer's disease, or explosive temper in patients with ADHD; persistent hiccups; and status epilepticus refractory to IV diazepam.

**Administration Alerts**

- Valproic acid is a gastrointestinal (GI) irritant. Advise patients not to chew extended-release tablets because mouth soreness will occur.
- Do not mix valproic acid syrup with carbonated beverages because it will trigger immediate release of the drug, which causes severe mouth and throat irritation.
- Open capsules and sprinkle on soft foods if the patient cannot swallow them.
- Pregnancy category D.

**PHARMACOKINETICS (PO CAPSULES)**

| Onset | Peak | Duration |
|---|---|---|
| 2–4 days | 1–4 h | 6–24 h |

**Adverse Effects**

Side effects include sedation, drowsiness, GI upset, and prolonged bleeding time. Other effects include visual disturbances, muscle weakness, tremor, psychomotor agitation, bone marrow suppression, weight gain, abdominal cramps, rash, alopecia, pruritus, photosensitivity, erythema multiforme, and fatal hepatotoxicity. **Black Box Warning:** May result in fatal hepatic failure, especially in children under the age of 2 years. Nonspecific symptoms often precede hepatotoxicity: weakness, facial edema, anorexia, and vomiting. Liver function tests should be performed prior to treatment and at specific intervals during the first 6 months of treatment. Valproic acid can produce life-threatening pancreatitis and teratogenic effects, including spina bifida.

**Contraindications:** Hypersensitivity may occur. This medication should not be administered to patients with liver disease, bleeding dysfunction, pancreatitis, and congenital metabolic disorders.

**Interactions**

**Drug–Drug:** Valproic acid interacts with many drugs. For example, aspirin, cimetidine, chlorpromazine, erythromycin, and felbamate may increase valproic acid toxicity. Concomitant warfarin, aspirin, or alcohol use can cause severe bleeding. Alcohol, benzodiazepines, and other CNS depressants potentiate CNS depressant action. Use of clonazepam concurrently with valproic acid may induce absence seizures. Valproic acid increases serum phenobarbital and phenytoin levels. Lamotrigine, phenytoin, and rifampin lower valproic acid levels.

**Lab Tests:** Unknown.

**Herbal/Food:** Unknown.

## Complementary and Alternative Therapies

### THE KETOGENIC DIET FOR EPILEPSY

The ketogenic diet is most often used when seizures cannot be controlled through pharmacotherapy or when there are unacceptable adverse effects to the medications. Before antiseizure drugs were developed, this diet was a primary treatment for epilepsy. Recent studies have examined the possibility that the ketogenic diet could provide benefit for patients with Alzheimer's, Parkinson's, and other neurodegenerative diseases (Rajagopal, Sangam, Singh, & Joginapally, 2016; Veyrat-Durebex et al., 2018). The exact mechanism behind the effectiveness of the diet is unknown and appears to include both direct effect from ketone body increases, and metabolic changes that occur, increasing GABA and inhibitory neurotransmitters (Rho, 2017).

has a ketogenic ratio of 3 or 4 g of fat to 1 g of protein and carbohydrate (Azevedo de Lima et al., 2017). Because of the high ratio of fat in the diet, complications such as hyperlipidemia and hepatotoxicity may occur, and patients on this diet need to be monitored long term to detect these adverse effects (Azevedo de Lima et al., 2017; Arslan et al., 2016,).

Research suggests that the diet produces a high success rate compared to standard treatment, with better control of seizures. Improvement may be noted rapidly and the diet appears to be equally effective for every seizure type. The most frequently reported adverse effects include vomiting, fatigue, constipation, diarrhea, and hunger. Cost and the difficulty of following the diet long term may also limit

## Treating the Diverse Patient: Sports-Related Concussions

There is increased awareness and concern about sports-related concussions at all ages. Concussions are a form of traumatic brain injury (TBI) and can range from mild to severe, with immediate and long-term consequences, including dementia and chronic traumatic encephalopathy (Thomas et al., 2018). Ban, Botros, Madden, and Batjer (2016) found a relatively low incidence of sports-related TBI, but an estimated 13% of pediatric and 14% of adult injuries were considered moderate to severe. While headaches, dizziness, and visual disturbances were common after a mild injury, seizures were more common with severe sports-related concussions, and symptoms may persist and become chronic (Choe et al., 2016; Merritt, Rabinowitz, & Arnett, 2015).

Early detection and intervention is a key strategy in the appropriate treatment of a concussion, but not all patients, particularly children, seek treatment. Bryan, Rowhani-Rahbar, Comstock, & Rivara (2016) found that as many as 52% of high school sports and recreation-related concussions were not reported to a healthcare provider, and the authors recommend expanding research to include recreation-related injuries as a cause of TBI. For children, parents play a key role in identifying and managing these injuries. However, particularly among parents with low income, education is lacking (Lin et al., 2015). Because seizures and long-term complications may occur after a moderate to severe injury, education on prevention and early detection may help to decrease these consequences.

## Community-Oriented Practice

**PREPARING FOR DISASTERS: THE NURSE'S ROLE**

When a disaster strikes, nurses and other healthcare providers may be expected to provide disaster relief, whether or not they have received training in this area. Normal healthcare infrastructure may be severely diminished or absent, and nurses will be relied on to provide care and information and to be able to improvise due to a lack of resources. Ruskie (2016) points out that during such a disaster people and nurses experience the loss of basic needs, such as electricity and water, and a lack of providers, supplies, equipment, and staff. As well, nurses find themselves tending to populations not usually encountered in their usual practice setting, such as the homeless or mentally ill. All of this can cause nurses to experience psychosocial, physical, and emotional distress in ways that could not be anticipated in disaster preparedness drills.

In reviewing the state of current preparedness, Adams, Karlin, Eisenman, Blakely, and Glick (2017) and Gowing, Walker, Elmer, and Cummings (2017) suggest that community-oriented, interprofessional team approaches will be needed, and they advocate for preparedness and training that goes beyond the current hospital or healthcare-based training programs. Novel approaches to training include using interactive, gaming, or other virtual strategies; involving communities in awareness and training for personal preparedness; and providing training that involves healthcare teams with defined competencies.

Whether the cause is a natural disaster, such as a tornado, an earthquake, or a hurricane, or a disaster caused by accidental causes or terrorism, nurses may be called upon to work very long hours, use whatever supplies they have on hand, make decisions without the benefit of consulting with other healthcare providers, and use the full extent of their education to make decisions about care. Planning ahead, participating in disaster preparedness drills while also expecting reduced or absent resources, working with unfamiliar patient populations, and becoming the resource for a community may be expected of the nurse in a disaster. Expecting the unexpected, but being prepared, is a role that nurses are well trained to fulfil.

## Lifespan Considerations

**Nonmedical Use of CNS Stimulant Medications**

Whether due to improved diagnostic criteria or a true increase, the number of children in the United States diagnosed with ADHD continues to increase (Centers for Disease Control, 2018). As CNS stimulant prescriptions are used to treat the condition, the potential for misuse of the drugs rises. Multiple studies have investigated the nonmedical use of CNS stimulant medications (i.e., the misuse and diversion of the drugs for purposes other the prescribed condition), and commonalities have emerged.

For children and adolescents, it appears that the earlier a stimulant drug is started, the less the chance for nonmedical use later, suggesting that there is a crucial time in brain and physical development that may increase the risk of misuse when the drugs are started in late childhood or adolescence (McCabe, Veliz, & Boyd, 2016). Among adolescents who used ADHD stimulants inappropriately, it was found that there was often a concurrent substance misuse problem, with alcohol being the most common substance also used (Chen, Crum, Strain, Martins, & Mojtabai, 2015; McCabe, Veliz, & Patrick, 2017). Overall, a slight decrease in the use of amphetamine misuse declined in recent years in adolescents (Johnston et al., 2015), but no decline was noted in adults age 21 to 55 (Schulenberg et al., 2017). Physician prescribing practices also play a role. Colaneri, Keim, and Adesman (2017) found that few physicians used medication contracts or distributed drug education literature to their patients.

Being aware of high-risk populations can assist nurses with targeting interventions. "SBIRT" is an evidence-based model to identify and begin treatment for substance misuse (SAMHSA-HRSA Center for Integrated Health Solutions, n.d.). Using the model, **S**creening, **B**rief **I**ntervention, and **R**eferral to **T**reatment begins the process of treatment for substance misuse. Because nurses are often the first healthcare professional the patient encounters, and the one who provides the most health teaching, using the SBIRT model and a thorough drug and social history may aid in determining the patients most in need of additional treatment.

## Applying Research to Nursing Practice: New Uses for Ketamine

Ketamine is classified as a general anesthetic that is used for conscious sedation, where a patient is conscious but dissociated from their environment with resultant amnesia. With the concern for opioid misuse, research into additional uses for ketamine is ongoing.

Past studies have demonstrated that ketamine has some effectiveness in treating depression in patients with bipolar disorder and depression in patients with a family history of alcohol use disorder (Niciu et al., 2014; Zarate et al., 2012). More recent studies have shown that ketamine may be useful in the treatment of post-traumatic stress disorder (PTSD), for treatment-resistant depression, and as a treatment for pain (Buvanendran et al., 2018; Hartberg, Garrett-Walcott, & De Gioannis, 2018; Krystal et al., 2017; Schoevers, Chaves, Balukova, Rot, & Kortekaas, 2016). As concern grows over the misuse of opioids, previous studies into the use of nonopioid treatments are being reconsidered.

Ketamine is usually given parenterally, but oral use has also been shown to be effective (Buvanendran et al., 2018; Hartberg, Garrett-Walcott, & De Gioannis, 2018; Schoevers et al., 2016). Specialized treatment centers are also being established touting the use of ketamine for depression, PTSD, obsessive–compulsive disorder, and fibromyalgia, even though published research accounts are in the preliminary stages. The authors acknowledge the need for more research and randomized clinical trials before the drug can be recommended for these disorders. Because patients may inquire about these treatment centers, nurses should know that ketamine is not currently approved for use in these conditions and advise patients to discuss any adjunctive treatment with their healthcare provider.

**Patient Safety:** Inappropriate Drug Substitution

A patient has Tylenol #3 with codeine ordered. When opening the medication dispensing system, the cassette for Tylenol #3 is empty, but Tylenol #2 is available. Consulting a drug guide as needed, why would it be inappropriate for the nurse to give two Tylenol #2 tablets in place of one Tylenol #3? *See Appendix A for the answer.*

**PharmFacts**

**ANXIETY DISORDERS**

- An estimated 40 million American adults suffer from anxiety disorders.
- Illnesses that commonly coexist with anxiety include depression, eating disorders, and substance abuse.
- Anxiety disorders affect 25% of children between the ages of 13 and 18.
- Although highly treatable, only about 37% of those having an anxiety disorder receive treatment. (Anxiety and Depression Association of America, n.d.)

Source: Anxiety and Depression Association of America. (n.d.). Facts and statistics. Retrieved from https://www.adaa.org/about-adaa/press-room/facts-statistics

**Check Your Understanding 13.1**

A 64-year-old man is taking atenolol (Tenormin) for treatment of hypertension. His seasonal allergies have been worse this year, and he is considering an OTC decongestant, pseudoephedrine (Sudafed), which a friend recommended. Is this medication safe for him to take? *See* Appendix A *for the answer*.

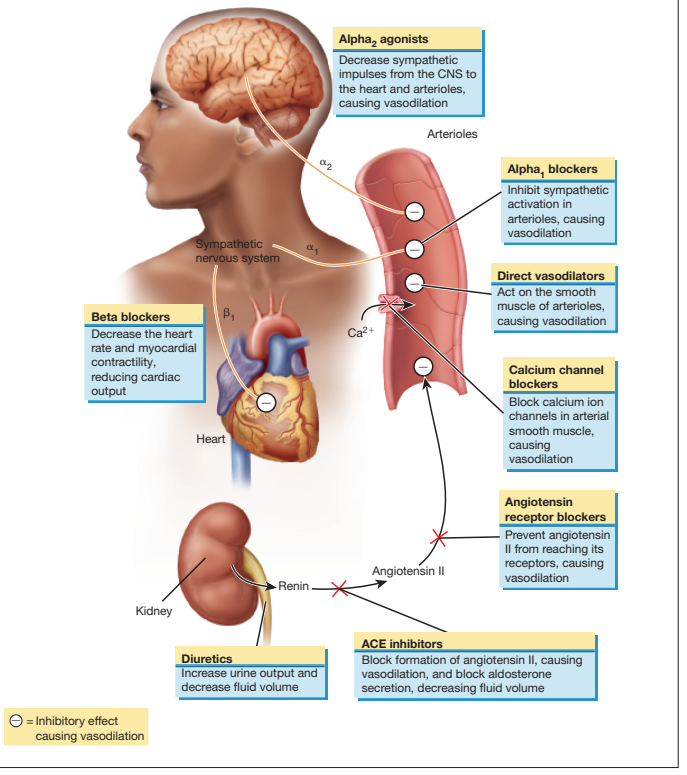
One of the strongest components of *Pharmacology for Nurses: A Pathophysiologic Approach* is the Nursing Practice Application feature. This feature clearly and concisely relates pharmacotherapy to patient assessment, planning patient outcomes, implementing patient-centered care, and evaluating the outcomes. Student feedback has shown that these Nursing Process Application charts are a significant component of planning and implementing nursing care plans.

The QSEN competencies related to patient-centered care, teamwork and collaboration, evidence-based practice, and patient safety are incorporated throughout the features and Nursing Practice Application charts.

No pharmacology text is complete unless it contains a method of self-assessment by which students may gauge their progress. *Pharmacology for Nurses: A Pathophysiologic Approach* contains an end-of-chapter review of the major concepts. NCLEX-RN®-style questions, a Patient-Focused Case Study with critical thinking questions, and an additional set of Critical Thinking questions allow students to check their retention of chapter material. References and Selected Bibliography sources are also located at the end of each chapter.

**Pharmacotherapy Illustrated**

**26.1 | Mechanism of Action of Antihypertensive Drugs**



# Nursing Practice Application

## Pharmacotherapy with Adrenergic Drugs

### ASSESSMENT

**Baseline assessment prior to administration:**

- Obtain a complete health history and drug history, including allergies, current prescription and over-the-counter (OTC) drugs, and herbal preparations. Be alert to possible drug interactions.
- Evaluate appropriate laboratory findings, such as liver or kidney function studies.
- Obtain baseline vital signs, weight, and urinary and cardiac output as appropriate.
- Assess the nasal mucosa for excoriation or bleeding prior to beginning therapy for nasal congestion.
- Assess the patient's ability to receive and understand instruction. Include the family and caregivers as needed.

**Assessment throughout administration:**

- Assess for desired therapeutic effects (e.g., increased ease of breathing, blood pressure (BP) within normal range, nasal congestion improved).
- Continue frequent and careful monitoring of vital signs and urinary and cardiac output as appropriate, especially if IV administration is used.
- Assess for and promptly report adverse effects: tachycardia, hypertension, dysrhythmias, tremors, dizziness, headache, and decreased urinary output. Immediately report severe hypertension, seizures, and angina, which may signal drug toxicity.

### IMPLEMENTATION

| Interventions and (Rationales) | Patient-Centered Care |
|---|---|
| **Ensuring therapeutic effects:**<br>• Continue frequent assessments for therapeutic effects. (Pulse, BP, and respiratory rate should be within normal limits or within the parameters set by the healthcare provider. Nasal congestion should be decreased; reddened, irritated sclera should be improved.) | • Teach the patient or caregiver how to monitor the pulse and BP, as appropriate. Ensure the proper use and functioning of any home equipment obtained. |
| • Provide supportive nursing measures; e.g., proper positioning for dyspnea, shock. (Supportive nursing measures will supplement therapeutic drug effects and optimize the outcome.) | • Teach the patient to report increasing dyspnea despite medication therapy and to not take more than the prescribed dose unless instructed otherwise by the healthcare provider. |
| **Minimizing adverse effects:**<br>• Monitor for signs of excessive autonomic nervous system stimulation and notify the healthcare provider if the BP or pulse exceeds established parameters. Continue frequent cardiac monitoring (e.g., electrocardiogram [ECG], cardiac output) and urine output if IV adrenergics are given. (Adrenergic drugs stimulate the heart rate and raise BP, and require frequent monitoring. **Lifespan:** The older adult may be at greater risk due to previously existing cardiovascular disease. **Diverse Patients:** Research suggests African Americans may experience an impaired [diminished] vascular response to isoproterenol, and vital signs should be monitored frequently during administration.) | • Instruct the patient to report palpitations, shortness of breath, chest pain, excessive nervousness or tremors, headache, or urinary retention immediately.<br>• Teach the patient to limit or eliminate the use of foods and beverages that contain caffeine because these may cause excessive nervousness, insomnia, and tremors. |
| • Closely monitor the IV infusion site when using IV adrenergics. All IV adrenergic drips should be given via infusion pump. (Blanching at the IV site is an indicator of extravasation and the IV infusion should be immediately stopped and the provider contacted for further treatment orders. Infusion pumps allow precise dosing of the medication.) | • To allay possible anxiety, teach the patient about the rationale for all equipment used and the need for frequent monitoring. |
| • Continue to monitor blood glucose and appropriate laboratory work. (Adrenergic stimulation may increase blood glucose.) | • Teach the patient with diabetes to monitor his or her blood glucose more frequently and to notify the healthcare provider if a consistent increase is noted. A change in antidiabetes medications or dosing may be required if glucose remains elevated. |
| • Monitor oral and nasal mucosa and breath sounds in patients taking inhaled adrenergic drugs. (Inhaled epinephrine and other adrenergic drugs may reduce bronchial secretions, making removal of mucus more difficult.)<br>• Inspect nasal mucosa for irritation, rhinorrhea, or bleeding after nasal use. Avoid prolonged use of adrenergic nasal sprays. (Vasoconstriction may cause transient stinging, excessive dryness, or bleeding. Rebound congestion with chronic rhinorrhea may result after prolonged treatment.) | • Teach the patient to increase fluid intake to moisten airways and assist in the expectoration of mucus, unless contraindicated.<br>• Instruct the patient not to use nasal spray longer than 3–5 days without consulting the provider. OTC saline nasal sprays may provide comfort if mucosa is dry and irritated. Increasing oral fluid intake may also help with hydration.<br>• **Lifespan:** Teach the caregiver that adrenergic nasal sprays and other decongestants are not recommended in children and should be used only under a provider's supervision. |
| • Provide for eye comfort such as darkened room, soft cloth over eyes, and sunglasses. Transient stinging after installation of eyedrops may occur. (Mydriasis and photosensitivity to light may occur. Localized vasoconstriction may cause stinging of the eyes.) | • Instruct the patient that photosensitivity may occur and sunglasses may be needed in bright light or for outside activities. The provider should be notified if irritation or sensitivity occurs beyond 12 hours after the drug has been discontinued. Soft contact lens users should check with the provider before using, as some solutions may stain lenses. **Lifespan & Safety**: Assist the older adult with ambulation if blurred vision or light sensitivity occurs, to prevent falls. |
| **Patient understanding of drug therapy:**<br>• Use opportunities during administration of medications and during assessments to provide patient education. (Using time during nursing care helps to optimize and reinforce key teaching areas.) | • The patient or caregiver should be able to state the reason for the drug; dose and scheduling; adverse effects to observe for and when to report; equipment needed as appropriate and how to use that equipment; and the required length of medication therapy needed with any special instructions regarding renewing or continuing the prescription as appropriate. |
| **Patient self-administration of drug therapy:**<br>• When administering medications, instruct the patient or caregiver in proper self-administration of an inhaler, epinephrine injection kit, nasal spray, or ophthalmic drops. (Using time during nurse administration of these drugs helps to reinforce teaching.) | • Instruct the patient in proper administration techniques, followed by teach-back. Inhalation forms should only be dispensed when the patient is upright to properly aerosolize the drug and prevent overdosage from excessively large droplets.<br>• Teach the patient or caregiver proper technique for epinephrine auto-injector and to have on hand for emergency use at all times. If epinephrine auto-injector is needed and used, 911 and the healthcare provider should be called immediately after use.<br>• Teach the patient or caregiver to not share nasal sprays with other people to prevent infection.<br>• The patient or caregiver is able to discuss appropriate dosing and administration needs. |

See Table 13.3 for a list of drugs to which these nursing actions apply.

## Chapter Review

### KEY Concepts

The numbered key concepts provide a succinct summary of the important points from the corresponding numbered section within the chapter. If any of these points are not clear, refer to the numbered section within the chapter for review.

**13.1** Norepinephrine is the primary neurotransmitter released at adrenergic receptors, which are divided into alpha and beta subtypes. Drugs can affect nervous transmission across a synapse by preventing the synthesis, storage, or release of the neurotransmitter; by preventing the destruction of the neurotransmitter; or by influencing the binding of neurotransmitters to the receptors.

**13.2** Sympathomimetics act directly by activating adrenergic receptors or indirectly by increasing the release of norepinephrine from nerve terminals. They are used primarily for their effects on the heart (hypertension, cardiac arrest), bronchial tree (asthma, COPD), and nasal passages (nasal congestion).

**13.3** Adrenergic-blocking drugs are used primarily for treatment of hypertension (minor use for BPH) and are the most widely prescribed class of autonomic drugs.

### REVIEW Questions

1. Following administration of phenylephrine (Neo-Synephrine), the nurse would assess for which adverse drug effects?
   1. Insomnia, nervousness, and hypertension
   2. Nausea, vomiting, and hypotension
   3. Dry mouth, drowsiness, and dyspnea
   4. Increased bronchial secretions, hypotension, and bradycardia
3. Propranolol (Inderal) has been ordered for a patient with hypertension. Because of adverse effects related to this drug, the nurse would carefully monitor for which adverse effect?
   1. Bronchodilation
   2. Tachycardia
   3. Edema
   4. Bradycardia
4. The healthcare provider prescribes epinephrine (Adrenalin) for a patient who was stung by several wasps 30 minutes ago and is experiencing an allergic reaction. The nurse knows that the primary purpose of this medication for this patient is to:
   1. Stop the systemic release of histamine produced by the mast cells.
   2. Counteract the formation of antibodies in response to an invading antigen.
   3. Increase the number of white blood cells produced to fight the primary invader.
   4. Increase a declining blood pressure and dilate constricting bronchi associated with anaphylaxis.
2. A patient is started on atenolol (Tenormin). Which is the most important action to be included in the plan of care for this patient related to this medication?
   1. Monitor apical pulse and blood pressure.
   2. Elevate the head of the bed during meals.
   3. Take the medication after meals.
   4. Consume foods high in potassium.
5. To avoid the first-dose phenomenon, the nurse knows that the initial dose of prazosin (Minipress) should be:
   1. Very low and given at bedtime.
   2. Doubled and given before breakfast.
   3. The usual dose and given before breakfast.
   4. The usual dose and given immediately after breakfast.
6. A patient who is taking an adrenergic-blocker for hypertension reports being dizzy when first getting out of bed in the morning. The nurse should advise the patient to:
   1. Move slowly from the recumbent to the upright position.
   2. Drink a full glass of water before rising to increase vascular circulatory volume.
   3. Avoid sleeping in a prone position.
   4. Stop taking the medication.

### PATIENT-FOCUSED Case Study

Tyrone Mathey is a 48-year-old man who is an attorney at a large law firm. He has made an appointment with his healthcare provider today for increased feelings of anxiety, headaches, and "just not feeling well." His medical and family histories indicate that both of his parents died within the last 10 years. His father died of a stroke and his mother died of a heart attack. Mr. Mathey states that he has been prescribed prazosin (Minipress) in the past but he stopped taking it. When questioned about why he chose not to take the medication, he reluctantly confides in you that he suspected the medication was causing adverse sexual effects. His body temperature is 37°C (98.6°F), heart rate is 88 beats/min, respiratory rate is 18 breaths/min, and blood pressure is 160/90 mmHg. During the examination, an ECG and laboratory test results were all within normal limits.

1. Identify the mechanism of action associated with prazosin (Minipress).
2. Could the prazosin (Minipress) be the cause of his sexual adverse effects?
3. As this patient's nurse, how would you approach the topic of medication-induced sexual dysfunction?

### CRITICAL THINKING Questions

1. A 24-year-old patient is evaluated for seasonal allergies by his healthcare provider. The provider recommends phenylephrine (Neo-Synephrine) nasal spray to treat symptoms related to allergic rhinitis. When teaching this patient about his medication, what therapeutic effects will the phenylephrine (Neo-Synephrine) provide? What adverse effects should the patient be observant for?
2. A 66-year-old man has had increasing trouble with urination, including difficulty starting to urinate and feeling that his bladder has not completely emptied. His provider prescribes doxazocin (Cardura) for treatment of BPH. The patient is alarmed and asks the nurse, "Why was I prescribed this? My brother takes it for high blood pressure and my blood pressure is normal!" As the nurse, how would you respond?

*See Appendix A for answers and rationales for all activities.*

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Although difficult and challenging, the study of pharmacology is truly a fascinating lifelong journey. We hope we have succeeded in writing a textbook that makes that study easier and more understandable so that nursing students will be able to provide safe, effective nursing care to patients who are undergoing drug therapy. We hope students and faculty will share with us their experiences using this textbook and all its resources.

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