chapter 40

Antiarrhythmic Drugs

Key Terms

action potential
arrhythmia
blockade effect
cinchonism
depolarization
polarization
proarrhythmic effect
refractory period
repolarization
threshold

Chapter Objectives

On completion of this chapter, the student will:

- Describe various types of cardiac arrhythmias.
- Discuss the uses, general drug actions, general adverse reactions, contraindications, precautions, and interactions of the antiarrhythmic drugs.
- Discuss important preadministration and ongoing assessments the nurse should perform on a patient taking an antiarrhythmic drug.
- List some nursing diagnoses particular to a patient taking an antiarrhythmic drug.
- Discuss ways to promote an optimal response to therapy, how to manage common adverse reactions, and important points to keep in mind when educating patients about the use of antiarrhythmic drugs.

The antiarrhythmic drugs are primarily used to treat cardiac arrhythmias. A cardiac **arrhythmia** is a disturbance or irregularity in the heart rate, rhythm, or both, which requires administration of one of the antiarrhythmic drugs. Some examples of cardiac arrhythmias are listed in Table 40-1.

An arrhythmia may occur as a result of heart disease or from a disorder that affects cardiovascular function. Conditions such as emotional stress, hypoxia, and electrolyte imbalance also may trigger an arrhythmia. An electrocardiogram (ECG) provides a record of the electrical activity of the heart. Careful interpretation of the ECG along with a thorough physical assessment is necessary to determine the cause and type of arrhythmia. The goal of antiarrhythmic drug therapy is to restore normal cardiac function and to prevent life-threatening arrhythmias.

ACTIONS

The cardiac muscle (myocardium) has attributes of both nerve and muscle and therefore has the properties of both. Some cardiac arrhythmias are caused by the generation of an abnormal number of electrical impulses (stimuli). These abnormal impulses may come from the sinoatrial node or may be generated in other areas of the myocardium. The antiarrhythmic drugs are classified according to their effects on the action potential of cardiac cells and their presumed mechanism of action. As understanding of the pathophysiology of cardiac arrhythmias and the drugs used to treat these arrhythmias has increased, a method of classification has been developed that includes four basic classifications and several subclasses. Drugs in each class have certain similarities, yet each drug has subtle differences that make it unique.

Class I Antiarrhythmic Drugs

Class I antiarrhythmic drugs, such as moricizine, have a membrane-stabilizing or anesthetic effect on the cells of the myocardium, making them valuable in treating cardiac arrhythmias. Class I antiarrhythmic drugs contain the largest number of drugs of the four classifications. Because the actions differ slightly, they are subdivided into classes I-A, I-B, and I-C.

Class I-A

The drugs disopyramide, procainamide, and quinidine are examples of class I-A drugs. Quinidine depresses

TABLE 40-1 Types of Arrhythmias

ARRHYTHMIA	DESCRIPTION
Atrial flutter	Rapid contraction of the atria (up to 300 bpm) at a rate too rapid for the ventricles to pump efficiently
Atrial fibrillation	Irregular and rapid atrial contraction, resulting in a quivering of the atria and causing an irregular and inefficient ventricular contraction
Premature ventricular contractions	Beats originating in the ventricles instead of the sinoatrial node in the atria, causing the ventricles to contract before the atria and resulting in a decrease in the amount of blood pumped to the body
Ventricular tachycardia	A rapid heartbeat with a rate of more than 100 bpm, usually originating in the ventricles
Ventricular fibrillation	Rapid disorganized contractions of the ventricles resulting in the inability of the heart to pump any blood to the body, which will result in death unless treated immediately

myocardial excitability or the ability of the myocardium to respond to an electrical stimulus. By depressing the myocardium and its ability to respond to some, but not all, electrical stimuli, the pulse rate decreases and the arrhythmia is corrected. Quinidine also prolongs or lengthens the refractory (resting) period and decreases the height and rate of the action potential of the impulses traveling through the myocardium.

All cells are electrically polarized, with the inside of the cell more negatively charged than the outside. The difference in electrical charge is called the resting membrane potential. Nerve and muscle cells are excitable and can change the resting membrane potential in response to electrochemical stimuli. The **action potential** is an electrical impulse that passes from cell to cell in the myocardium, stimulating the fibers to shorten, causing muscular contraction (systole). After the action potential passes, the fibers relax and return to their resting length (diastole). An action potential generated in one part of the myocardium passes almost simultaneously through all of the fibers, causing rapid contraction.

Only one impulse can pass along a nerve fiber at any given time. After the passage of an impulse, there is a brief pause, or interval, before the next impulse can pass along the nerve fiber. This pause is called the **refractory period,** which is the period between the transmission of nerve impulses along a nerve fiber. By lengthening the refractory period, the number of impulses traveling along a nerve fiber within a given time is decreased. For example, a patient has a pulse rate of 120 bpm. By lengthening the refractory period between each impulse and decreasing the height and rate of the rise of action potential, fewer impulses would be generated each minute, and the pulse rate would decrease. Procainamide is thought to act by decreasing the rate of diastolic depolarization in the ventricles, decreasing the rate and height of the action potential and increasing the fibrillation threshold. Disopyramide (Norpace) decreases the rate of depolarization of myocardial fibers during the diastolic phase of the cardiac cycle, prolongs the refractory period, and decreases the rate of rise of the action potential.

Nerve cells have positive ions on the outside and negative ions on the inside of the cell membrane when they are at rest (Fig. 40-1). This is called **polarization.** When a stimulus passes along the nerve, the positive ions move from outside the cell into the cell, and the negative ions move from inside the cell to outside the cell. This movement of ions is called **depolarization.** Unless positive ions move into and negative ions move out of a nerve cell, a stimulus (or impulse) cannot pass along the nerve fiber. Once the stimulus has passed along the nerve fiber, the positive and negative ions move back to their original place, that is, the positive ions on the outside and the negative ions on the inside of the nerve cell. This movement back to the original place is called **repolarization.** By decreasing the rate (or speed) of depolarization, the stimulus must literally wait for this process before it can pass along the nerve fiber. Thus, decreasing the rate of depolarization decreases the number of impulses that can pass along a nerve fiber during a specific time period.

Class I-B Drugs

Lidocaine (Xylocaine), the representative class I-B drug, raises the threshold of the ventricular myocardium. **Threshold** is a term applied to any stimulus of the lowest intensity that will give rise to a response in a nerve fiber. A stimulus must be of a specific intensity (strength, amplitude) to pass along a given nerve fiber (Fig. 40-2).

To further illustrate the threshold phenomenon using plain figures instead of precise electrical values, a certain nerve fiber has a threshold of 10. If a stimulus rated as 9 reaches the fiber, it will not pass along the fiber because its intensity is lower than the fiber's threshold of 10. If another stimulus reaches the fiber and is rated 14, it will pass along the fiber because its intensity is greater than the fiber's threshold of 10. If the threshold of a fiber is raised from 10 to 15, only the stimuli greater than 15 can pass along the nerve fiber.

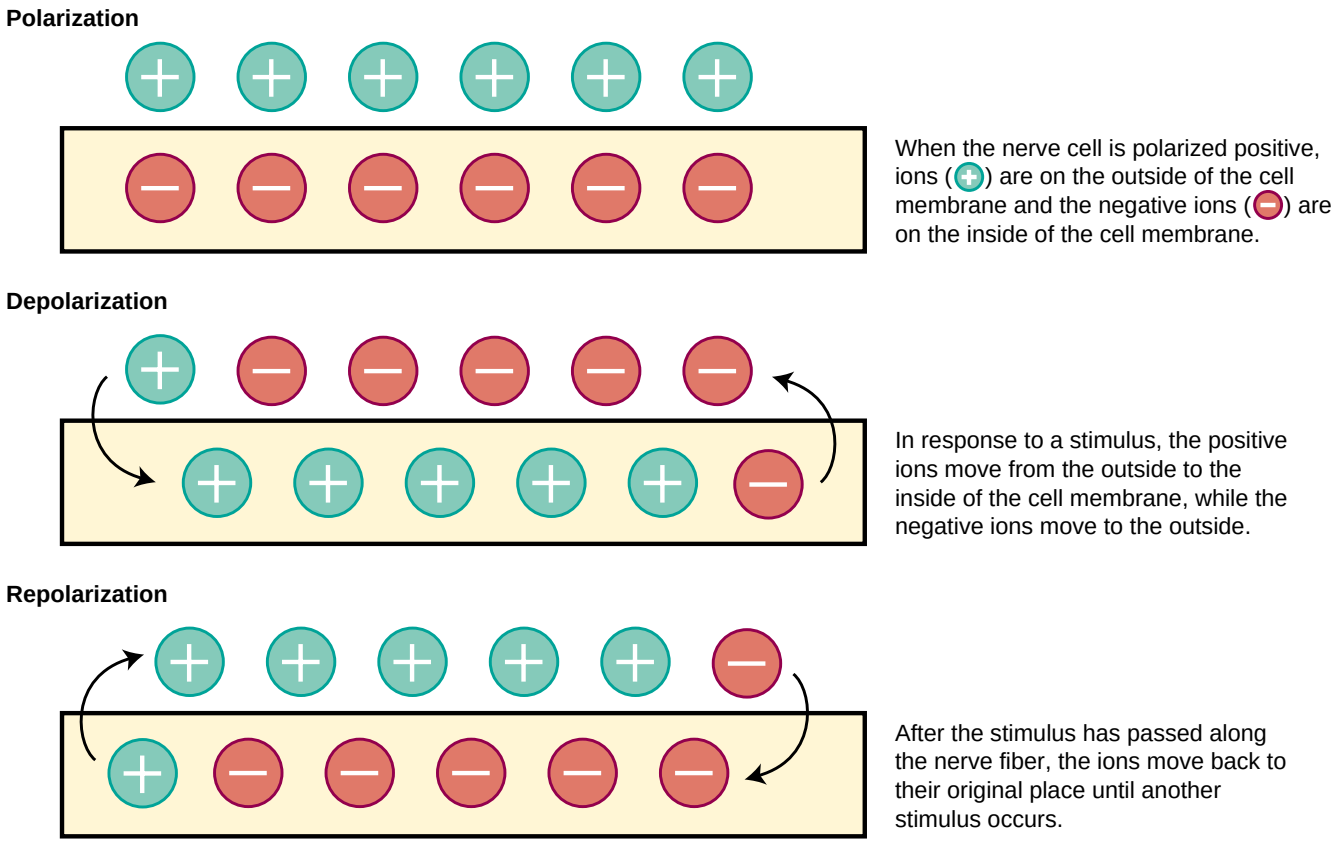
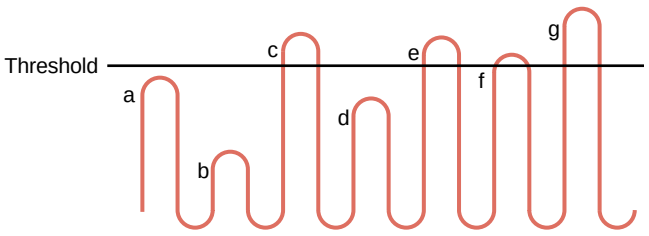
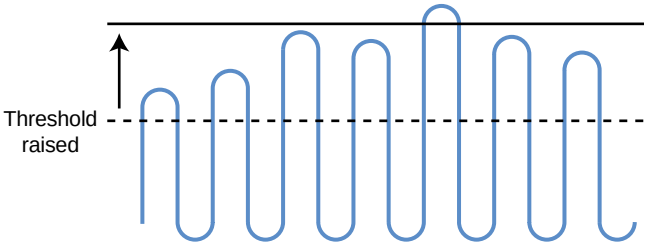


FIGURE 40-1. Polarization, depolarization, and repolarization.



A stimulus must reach the threshold to cause a response in a nerve fiber. Note that stimuli **a**, **b**, and **d** do *not* reach the threshold; therefore, they do *not* cause a response in a nerve fiber. Stimuli **c**, **e**, **f**, and **g** do reach and surpass the threshold, resulting in stimulation of nerve fiber.



After receiving lidocaine hydrochloride (Xylocaine HCl), the threshold is raised to a higher level, allowing fewer stimuli to reach the threshold. This results in decreased stimulation of the nerve fiber and prevents conduction of the nerve impulses causing the arrthythmia.

FIGURE 40-2. The threshold phenomenon.

Some cardiac arrhythmias result from many stimuli present in the myocardium. Some of these are weak or of low intensity but are still able to excite myocardial tissue. Lidocaine, by raising the threshold of myocardial fibers, reduces the number of stimuli that will pass along these fibers and therefore decreases the pulse rate and corrects the arrhythmia. Mexiletine (Mexitil) and tocainide (Tonocard) are also antiarrhythmic drugs with actions similar to those of lidocaine.

Class I-C Drugs

Flecainide (Tambocor) and propafenone (Rythmol) are examples of class I-C drugs. These drugs have a direct stabilizing action on the myocardium, decreasing the height and rate of rise of cardiac action potentials, thus slowing conduction in all parts of the heart.

Class II Antiarrhythmic Drugs

Class II antiarrhythmic drugs include beta (β)-adrenergic blocking drugs, such as acebutolol (Sectral), esmolol (Brevibloc), and propranolol (Inderal). These drugs also decrease myocardial response to epinephrine and norepinephrine (adrenergic neurohormones) because of their ability to block stimulation of β receptors of the

heart (see Chap. 23). Adrenergic neurohormones stimulate the β receptors of the myocardium and therefore increase the heart rate. Blocking the effect of these neurohormones decreases the heart rate. This is called a **blockade effect.**

Class III Antiarrhythmic Drugs

Bretylium (Bretylol) prolongs repolarization, prolongs refractory period, and increases the ventricular fibrillation threshold. Amiodarone (Cordarone) appears to act directly on the cardiac cell membrane, prolonging the refractory period and repolarization and increasing the ventricular fibrillation threshold. Newer class III antiarrhythmic drugs include ibutilide (Corvert) and dofetilide (Tikosyn). These two drugs are used to convert atrial fibrillation or flutter to a normal sinus rhythm. Ibutilide acts by prolonging the action potential, producing a mild slowing of the sinus rate and atrioventricular conduction. Dofetilide selectively blocks potassium channels, widens the QRS complex, and prolongs the action potential. The drug has no effect on calcium channels or cardiac contraction.

Class IV Antiarrhythmic Drugs

Class IV antiarrhythmic drugs include verapamil (Calan) and the other calcium channel blockers. Calcium channel blockers produce their antiarrhythmic action by inhibiting the movement of calcium through channels across the myocardial cell membranes and vascular smooth muscle. Contraction of cardiac and vascular smooth muscle depends on the movement of calcium ions into these cells through specific ion channels. By reducing the calcium flow, conduction through the sinoatrial (SA) and atrioventricular (AV) nodes is slowed and the refractory period is prolonged, resulting in suppression of the arrhythmia. The calcium channel blockers are also called slow channel blockers or calcium antagonists. Two calcium channel blockers that have been approved as antiarrhythmics are verapamil and diltiazem. Dosage ranges for the antiarrhythmic drugs are given in the Summary Drug Table: Antiarrhythmic Drugs.

USES

The uses of the antiarrhythmic drugs are given in the Summary Drug Table: Antiarrhythmic Drugs. In general these drugs are used to prevent and treat cardiac arrhythmias, such as premature ventricular contractions (PVCs), ventricular tachycardia (VT), premature atrial contractions (PACs), paroxysmal atrial tachycardia (PAT), atrial fibrillation, and atrial flutter. Some of the antiarrhythmic drugs are used for other conditions. For example, propranolol, in addition to its use as an antiarrhythmic, may also be used for patients with myocardial infarction. This drug has reduced the risk of death and repeated myocardial infarctions in those surviving the acute phase of a myocardial infarction. Additional uses include control of tachycardia in those with pheochromocytoma (a tumor of the adrenal gland that secretes excessive amounts of norepinephrine), migraine headaches, angina pectoris caused by atherosclerosis, and hypertrophic subaortic stenosis.

ADVERSE REACTIONS

General adverse reactions common to most antiarrhythmic drugs include light-headedness, weakness, hypotension, bradycardia, and drowsiness. Adverse reactions associated with the administration of specific antiarrhythmic drugs are given in the Summary Drug Table: Antiarrhythmic Drugs. All antiarrhythmic drugs may cause new arrhythmias or worsen existing arrhythmias, even though they are administered to resolve an existing arrhythmia. This phenomenon is called the **proarrhythmic effect.** This effect ranges from an increase in frequency of premature ventricular contractions (PVCs), to the development of more severe ventricular tachycardia, to ventricular fibrillation, and may lead to death. Proarrhythmic effects may occur at any time but occur more often when excessive dosages are given, when the preexisting arrhythmia is life-threatening, or if the drug is given IV.

CONTRAINDICATIONS

The antiarrhythmic drugs are reserved for emergency situations and are contraindicated in patients with known hypersensitivity to the antiarrhythmic drugs and during pregnancy and lactation. Most antiarrhythmic drugs are Pregnancy Category B or C drugs, indicating that safe use of these drugs during pregnancy, lactation, or in children has not been established. The antiarrhythmic drug amiodarone is a Pregnancy Category D drug, indicating that fetal harm can occur when the agent is administered to a pregnant woman. It is used only if the potential benefits outweigh the potential hazards to the fetus. Antiarrhythmic drugs are contraindicated in patients with second- or third-degree AV block (if the patient has no artificial pacemaker), severe congestive heart failure (CHF), aortic stenosis, hypotension, and cardiogenic shock. Quinidine and procainamide are contraindicated in patients with myasthenia gravis (see Chap. 24).

SUMMARY DRUG TABLE ANTIARRHYTHMIC DRUGS

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
Class I				
disopyramide *dye-soe-peer'-a-mide*	Norpace, Norpace CR, *generic*	Suppression and treatment of sustained ventricular tachycardia	Dry mouth, constipation, urinary hesitancy, blurred vision, nausea, fatigue, dizziness, headache, rash, hypotension, CHF	Ventricular arrhythmias: dosage individualized, 400–800 mg/d PO in divided doses
flecainide *fle-kay'-nide*	Tambocor	Paroxysmal atrial fibrillation/flutter and superventricular tachycardia	Dizziness, headache, faintness, unsteadiness, blurred vision, headache, nausea, dyspnea, CHF, fatigue, palpitations, chest pain	Initial dose: 50 mg PO q12h; maximum dosage, 300 mg/d
lidocaine HCl *lye'-doe-kane*	Xylocaine, *generic*	Ventricular arrhythmias	Light-headedness, nervousness, bradycardia, hypotension, drowsiness, apprehension	50–100 mg IV bolus; 1–4 mg/min IV infusion 20–50 μg/kg/min; 300 mg IM
mexiletine HCl *max-ill'-i-teen*	Mexitil	Ventricular arrhythmias	Palpitations, nausea, vomiting, chest pain, heartburn, dizziness, light-headedness, rash	Initial dose: 200 mg PO q8h; maximum dosage, 1200 mg/d PO
moricizine *mor-i'-siz-een*	Ethmozine	Life-threatening ventricular arrhythmias	Cardiac rhythm disturbances, existing arrhythmias worsened, palpitations, dizziness, headache, nausea, anxiety	600–900 mg/d PO in 3 equally divided doses
procainamide HCl *proe-kane-a'-mide*	Pronestyl, Pronestyl SR, Procanbid	Life-threatening ventricular arrhythmias	Hypotension, disturbances of cardiac rhythm, urticaria, fever, chills, nausea, vomiting, rash, confusion, dizziness, weakness, anorexia	Oral: 50 mg/kg/d PO in divided doses q3h; IM: 0.5–1.0 g q4–8h; IV: 500–600 mg over 25–30 min then 2–6 mg/min
propafenone HCl *proe-paf'-a-non*	Rythmol	Life-threatening ventricular arrhythmias	Dizziness, nausea, vomiting, constipation, unusual taste, first-degree AV block	Initial dose: 150 mg PO q8h; may be increased to 300 mg PO q8h
quinidine gluconate quinidine sulfate quinidine polygalacturonate *kwin'-i-deen*	Quinaglute, *generic* Quinidex Cardioquin	Premature atrial and ventricular contractions, atrial tachycardia and flutter, paroxysmal atrial fibrillation, chronic atrial fibrillation	Ringing in the ears, hearing loss, nausea, vomiting, dizziness, headache, rash, disturbed vision, proarrhythmias	Administer test dose of 1 tablet PO or 200 mg IM to test for idiosyncratic reaction. 200–300 mg TID, QID or 300–600 mg q8h or q/12h for SR; IM 600 mg quinidine gluconate, then 400 mg q2h; IV 300 mg quinidine gluconate slow IV at 1 mL/min of diluted solution
tocainide HCl *to-kay'-nide*	Tonocard	Life-threatening ventricular arrhythmias	Light-headedness, nausea, vomiting, tremor, vertigo, paresthesia, numbness, hallucinations, restlessness, sedation, blurred vision, cardiac arrhythmias	Initial dose: 400 mg PO q8h; may be increased to 1800 mg/d PO in divided doses
Class II				
acebutolol *ah-see-byoo'-toe-lol*	Sectral, *generic*	Ventricular arrhythmias, hypertension	Hypotension, nausea, diaphoresis, headache, fatigue, weakness, dizziness, impotence, CHF	Arrhythmias: initially 200 mg q12h PO; may increase to 1200 mg/d in 2 divided doses; hypertension: 400 mg/d in 1 or 2 doses PO; maintenance, 200–1200 mg in divided doses
esmolol HCl *ez'-moe-lol*	Brevibloc	Rapid, short-term treatment of ventricular rate in superventricular arrhythmia, sinus tachycardia	Dizziness, headache, hypotension, nausea, cold extremities, bradycardia	Loading dose: 500 μg/kg/min IV for 1 minute, followed by infusion of 50 μg/kg/min IV for 4 min; maintenance dose, 25 μg/kg/min IV

(*continued*)

SUMMARY DRUG TABLE ANTIARRHYTHMIC DRUGS (*Continued*)

GENERIC NAME	TRADE NAME*	USES	ADVERSE REACTIONS	DOSAGE RANGES
propranolol HCl *proe-pran'-oh-lole*	Inderal, *generic*	Cardiac arrhythmias, angina pectoris, hypertension, essential tremor, myocardial infarction, migraine headache	Fatigue, weakness, depression, bradycardia, dizziness, vertigo, rash, decreased libido, hypotension, hyperglycemia	Cardiac arrhythmias: 10–30 mg PO 3–4 times daily; life-threatening arrhythmias: 1–3 mg IV, may repeat once in 2 min; angina pectoris: 80–320 mg/d PO in 2–4 divided doses; hypertension: initially, 40 mg PO BID or 80 mg sustained released once daily; maintenance dose: up to 640 mg/d PO in divided doses
Class III				
amiodarone HCl *a-mee-o'-da-rone*	Cordarone, Pacerone, *generic*	Life-threatening ventricular arrhythmias	Malaise, fatigue, tremor, proarrhythmias, nausea, vomiting, constipation, ataxia, anorexia, bradycardia, photosensitivity	Loading dose: 800–1600 mg/d PO in divided doses; maintenance dose: 400 mg/d PO; up to 1000 mg/d over 24 h IV
bretylium tosylate *bre-til'-ee-um*	*generic*	Prophylaxis and treatment of ventricular fibrillation	Hypotension, nausea, vomiting, vertigo, dizziness, postural hypotension, bradycardia	Immediate treatment: 5–10 mg/kg (diluted) IV; maintenance: rate of 1–2 mg/min by continuous IV infusion or infuse intermittently at 5–10 mg/kg over 10–30 min q6h
dofetilide *doe-fe'-ti-lyed*	Tikosyn	Conversion of atrial fibrillation/flutter to normal sinus rhythm (NSR), maintenance of NSR	Headache, chest pain, dizziness, respiratory tract infection, dyspnea, nausea, flu syndrome, insomnia, proarrhythmias	Dosage based on ECG response and CCr; range, 125–500 μg BID
ibutilide fumarate *eye-byoo'-ti-lyed*	Corvert	Atrial fibrillation/flutter	Headache, nausea, hypo- or hypertension, ventricular arrhythmias	Adults 60 kg and more: 1 mg infused over 10 min; may repeat 10 min <60 kg: 0.1 mL/kg infused over 10 min; may repeat in 10 min
sotalol *sew'-tah-lol*	Betapace, Betapace AF	Treatment of life-threatening ventricular arrhythmias, reduction and delay of atrial fibrillation and flutter for ventricular arrhythmias (Betapace AF)	Drowsiness, difficulty sleeping, unusual tiredness or weakness, depression, decreased sexual libido, bradycardia, CHF, cold hands and feet, nausea, vomiting, nasal congestion, anxiety, life-threatening arrhythmias (proarrhythmias)	Initially: 80 mg BID PO; may increase up to 240–320 mg/d (Betapace); up to 120 mg BID (Betapace AF)
Class IV				
verapamil *ver-ap'-ah-mill*	Calan, Covera HS, Isoptin, Verelan, Verelan PM, *generic*	Superventricular tachyarrhythmias, temporary control of rapid ventricular rate in atrial flutter/fibrillation, angina, unstable angina, hypertension	Constipation, dizziness, light-headedness, headache, asthenia, nausea, peripheral edema, hypotension, proarrhythmias, CHF	Adults: Oral–initial dose 80–120 mg TID; maintenance 320–480 mg/d Hypertension: 240 mg PO daily; sustained release in AM 80 mg TID; ER capsules, 100–300 mg HS PO Parenteral: IV use only; initial dose 5–10 mg over 2 min; may repeat 10 mg 30 min later.

*The term *generic* indicates the drug is available in generic form.

PRECAUTIONS

All antiarrhythmic drugs are used cautiously in patients with renal or hepatic disease. When renal or hepatic dysfunction is present, a dosage reduction may be necessary. All patients should be observed for renal and hepatic dysfunction. Quinidine and procainamide are used cautiously in patients with CHF. Disopyramide is used cautiously in patients with CHF, myasthenia gravis, or glaucoma, and in men with prostate enlargement. Bretylium is used cautiously in patients with digitalis toxicity because the initial release of norepinephrine with digitalis toxicity may exacerbate arrhythmias and symptoms of toxicity. Verapamil is used cautiously in patients with a history of serious ventricular arrhythmias or CHF. Electrolyte disturbances such as hypokalemia, hyperkalemia, or hypomagnesemia may alter the effects of the antiarrhythmic drugs. Electrolytes are monitored frequently and imbalances corrected as soon as possible.

INTERACTIONS

When two antiarrhythmic drugs are administered concurrently the patient may experience additive effects and is at increased risk for drug toxicity. When quinidine and procainamide are administered with digitalis, the risk of digitalis toxicity is increased. Pharmacologic effects of procainamide may be increased when procainamide is administered with quinidine. When quinidine is administered with the barbiturates or cimetidine, quinidine serum levels may be increased. When quinidine is administered with verapamil, there is an increased risk of hypotensive effects. When quinidine is administered with disopyramide, there is an increased risk of increased disopyramide blood levels and/or decreased serum quinidine levels.

Propranolol may increase procainamide plasma levels. Additive cholinergic effects may occur when procainamide is administered with other drugs with anticholinergic effects. There is the potential of additive cardiodepressant effects when procainamide is administered with lidocaine. When a beta blocker, such as Inderal, is administered with lidocaine, there is an increased risk of lidocaine toxicity.

Propranolol may alter the effectiveness of insulin or oral hypoglycemic drugs. Dosage adjustments may be necessary.

Dofetilide is not administered with cimetidine because dofetilide plasma levels may be increased by as much as 50%. When treatment for gastric disorders is necessary, patients receiving dofetilide should take omeprazole, ranitidine, or antacids as an alternative to cimetidine.

Verapamil may cause an additive hypotensive effect when administered with other antihypertensives, alcohol, or the nitrates. Verapamil increases plasma digoxin levels and may cause bradycardia or CHF.

NURSING PROCESS

The Patient Receiving an Antiarrhythmic Drug

ASSESSMENT

Preadministration Assessment

Antiarrhythmic drugs are used to treat various types of cardiac arrhythmias. There are initial preadministration assessments the nurse performs before starting therapy that are the same for all antiarrhythmic drugs. These assessments include:

- Taking and recording the blood pressure, apical and radial pulses, and respiratory rate. This provides a database for comparison during therapy.
- Assessing the patient's general condition and including observations such as skin color (pale, cyanotic, flushed), orientation, level of consciousness, and the patient's general status (such as appears acutely ill or appears somewhat ill). All observations must be recorded to provide a means of evaluating the response to drug therapy.
- Recording any symptoms (subjective data) described by the patient.

Because all antiarrhythmic drugs may produce proarrhythmic effects, a careful preadministration assessment is essential. It is often difficult to distinguish a proarrhythmic effect from the patient's underlying rhythm disorder, so it is important that the nurse assess each patient taking an antiarrhythmic drug through the use of cardiac monitoring before therapy begins and in the ongoing assessment to determine if the patient is experiencing a therapeutic response to the drug, developing another arrhythmia, or is experiencing worsening of the original arrhythmia.

The primary health care provider may also order laboratory and diagnostic tests, renal and hepatic function tests, complete blood count, serum enzymes, and serum electrolytes. The nurse reviews these test results before the first dose is given and reports any abnormalities to the primary health care provider. The patient is usually placed on a cardiac monitor before antiarrhythmic drug therapy is initiated. The primary health care provider may order an ECG to provide baseline data for comparison during therapy.

Ongoing Assessment

During ongoing therapy with the antiarrhythmic drugs, the nurse takes the patient's blood pressure, apical and radial pulses, and respiratory rate at periodic intervals, usually every 1 to 4 hours. Specific intervals depend on

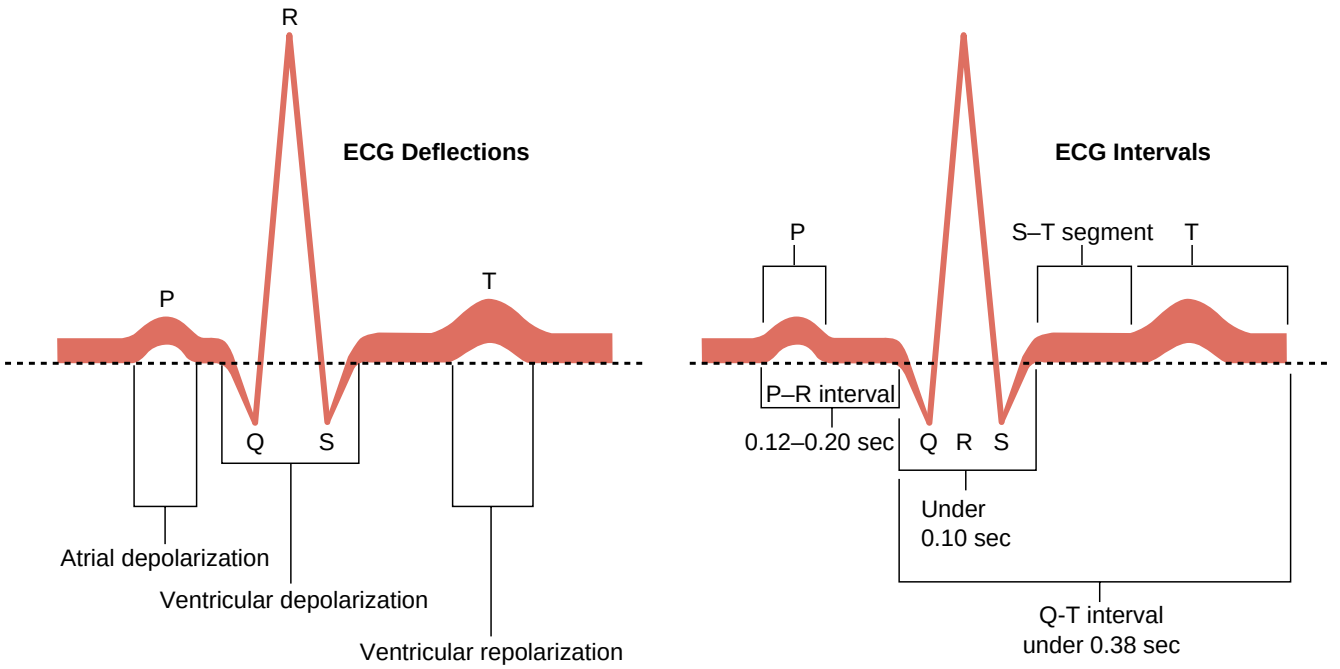


FIGURE 40-3. Normal QRS complex.

the primary health care provider's order or on nursing judgment and are based on the patient's general condition. The nurse closely observes the patient for a response to drug therapy, signs of CHF, the development of a new cardiac arrhythmia, or worsening of the arrhythmia being treated.

The nurse should immediately report to the primary health care provider any significant changes in the blood pressure, the pulse rate or rhythm, respiratory difficulty, change in respiratory rate or rhythm, or change in the patient's general condition.

Nursing Alert

When giving an oral antiarrhythmic drug, the nurse withholds the drug and notifies the primary health care provider immediately when the pulse rate is above 120 bpm or below 60 bpm. In some instances, the primary health care provider may establish additional or different guidelines for withholding the drug.

Continual cardiac monitoring assists the nurse in assessing the patient for adverse drug reactions. If the patient is acutely ill or is receiving one of these drugs parenterally, the nurse measures and records the fluid intake and output. The primary health care provider may order subsequent laboratory tests to monitor the patient's progress for comparison with tests performed in the preadministration assessment, such as an ECG, renal and hepatic function tests, complete blood count, serum enzymes, and serum electrolytes. The nurse reports to the primary care provider any abnormalities or significant interval changes of the ECG, such as prolongation of the PR or QT interval or widening of the QRS complex. (See Fig. 40-3 for a diagram of a normal QRS complex.) In addition, when subsequent laboratory tests are ordered, the nurse reviews the results and reports any abnormalities to the primary health care provider.

NURSING DIAGNOSES

Drug-specific nursing diagnoses are highlighted in the Nursing Diagnoses Checklist. Other nursing diagnoses applicable to these drugs are discussed in depth in Chapter 4.

PLANNING

The expected outcomes for the patient may include obtaining an optimal therapeutic response to drug therapy, management of adverse drug reactions, and an understanding of and compliance with the postdischarge drug regimen.

Nursing Diagnoses Checklist

- ✓ **Ineffective Tissue Perfusion: Peripheral** related to adverse drug reactions (hypotension)
- ✓ **Decreased Cardiac Output** related to adverse drug reactions (drug-induced arrhythmias)
- ✓ **Activity Intolerance** related to weakness and fatigue
- ✓ **Risk for Injury** related to adverse drug reactions (dizziness, light-headedness)

IMPLEMENTATION

Promoting an Optimal Response to Therapy

ADMINISTERING QUINIDINE. When quinidine is administered orally the drug is not crushed or chewed. Gastrointestinal upset can be reduced if the drug is given with food. The nurse must monitor serum quinidine levels during administration of the drug. Normal therapeutic levels range between 2 and 6 μg/mL. Toxic effects of quinidine usually occur at levels greater than 8 μg/mL.

ADMINISTERING PROCAINAMIDE. If procainamide is given IV, the nurse maintains continuous and close cardiac monitoring. When the drug is given IV, the nurse discontinues the drug immediately if changes in the ECG pattern occur. IV administration is by IV piggyback. Hypotension may be seen with IV administration; therefore, the blood pressure must be monitored every 15 minutes while the drug is being infused. The nurse keeps the patient supine during IV administration to minimize hypotension. If hypotension should occur, the drug therapy is discontinued, and the primary IV line is run at a rate to keep the vein open until the primary health care provider sees the patient. Although not the route of choice, the drug may be administered by IM injection. When the drug is given IM, the gluteus muscle is used and the injection sites are rotated.

When the drug is given orally, the nurse instructs the patient not to chew the capsule or tablet but to swallow it whole. For faster absorption, the drug is given with a full glass of water when the patient's stomach is empty, either 1 hour before or 2 hours after meals. If gastrointestinal upset occurs, the nurse can administer the drug with or immediately after meals. Sustained-released tablets should not be crushed or divided.

ADMINISTERING DISOPYRAMIDE. Disopyramide is administered to the patient with a full glass of water either 1 hour before or 2 hours after meals. If patients are receiving procainamide or quinidine, the manufacturer suggests that disopyramide therapy not be started for 6 to 12 hours after the last dose of quinidine and 3 to 6 hours after the last dose of procainamide. When the patient is to switch from taking the regular capsules to taking extended-release capsules, 6 hours should lapse after the last capsule before therapy is begun with the extended-release capsules.

ADMINISTERING LIDOCAINE. Lidocaine is most often administered IV either continuously diluted in D_5W or direct IV as a loading dose. When administered as a loading dose, the drug is given during a period of 1 minute with the dose repeated once after 5 minutes. The arrhythmia is usually controlled within 24 hours of continuous administration. The infusion is discontinued when the heart rhythm is stable or at the earliest sign of lidocaine toxicity. Blood lidocaine levels greater than 7 μg/mL are potentially toxic.

ADMINISTERING TOCAINIDE AND MEXILETINE. Tocainide and mexiletine are administered at 8-hour intervals and with food (or an antacid) to prevent gastrointestinal upset. In addition, administering tocainide with food may offer some protection against toxicity because the absorption rate is slowed in the presence of food.

ADMINISTERING FLECAINIDE AND PROPAFENONE. The nurse closely observes the patient for a response to drug therapy, signs of CHF, the development of a new cardiac arrhythmia, or worsening of the arrhythmia being treated. When flecainide is being administered, other antiarrhythmic drugs should be discontinued for at least two to four half-lives (time required for the blood level of a drug to decrease by 50%) of the drug being discontinued before flecainide therapy is begun. In general, when a drug therapy is discontinued, four to five half-lives are needed to eliminate the drug from the body. It is advisable to hospitalize the patient during withdrawal of the antiarrhythmic drug before initiating flecainide therapy because life-threatening arrhythmias may occur.

Propafenone is administered orally every 8 hours. Any previously given antiarrhythmic drug should be discontinued before propafenone therapy is started. Dosage changes are done 3 to 4 days apart because of the length of time the drug remains active in the body.

ADMINISTERING PROPRANOLOL. Cardiac monitoring is recommended when the drug is given IV because severe bradycardia and hypotension may be seen. The nurse obtains written instructions from the primary health care provider for propranolol administration. For example, the primary health care provider may want the drug to be withheld for a systolic blood pressure less than 90 mm Hg or a pulse rate less than 50 bpm.

ADMINISTERING BRETYLIUM. Bretylium is used in the emergency treatment of life-threatening ventricular arrhythmias. Because of its adverse reactions, bretylium is used when the arrhythmia is unresponsive to the other antiarrhythmic drugs. Baseline data will come from routine assessments made before the emergency. The nurse administers this drug IM or IV and uses continuous cardiac monitoring. The patient is placed in a supine position with suction equipment readily available in the event vomiting should occur.

Nursing Alert

A transient increase in arrhythmias and hypertension may occur within 1 hour after initial therapy with bretylium is begun. The nurse should take the blood pressure and respiratory rate every 5 to 15 minutes and obtain the pulse rate from the cardiac monitor. These activities are continued until the arrhythmia is corrected.

To discontinue use of the drug, the dosage should be gradually reduced during a period of 3 to 5 days. After administering the drug, the nurse observes the patient closely. An oral antiarrhythmic drug may be prescribed to provide continued stability to the cardiac muscle.

ADMINISTERING VERAPAMIL. This drug is used to manage supraventricular arrhythmias and rapid ventricular rates in atrial flutter or fibrillation. Continuous cardiac monitoring is necessary during IV administration. The nurse notifies the primary health care provider if bradycardia or hypotension occurs. Patients receiving a cardiac glycoside (eg, digoxin) concurrently with verapamil must be monitored for an increased risk of digitalis toxicity. Verapamil is administered orally with food to minimize gastric upset.

Monitoring and Managing Adverse Reactions

Nursing judgment is necessary in reporting other adverse reactions to the primary health care provider. For example, the patient with a dry mouth is in no danger, even though the condition is uncomfortable. Although the occurrence of this is reported to the primary health care provider, it is not of an emergency nature. In some instances, minor adverse reactions must be tolerated by the patient. However, the patient with severe bradycardia or prolonged nausea and vomiting is in a potentially dangerous situation. The nurse contacts the primary health care provider immediately because additional treatment may be necessary.

Proarrhythmic effects (worsening of the existing arrhythmia or causation of a new arrhythmia) may occur, such as severe ventricular tachycardia or ventricular fibrillation. It is often difficult to distinguish proarrhythmic effects from the patient's preexisting arrhythmia.

Nursing Alert

Antiarrhythmic drugs are capable of causing new arrhythmias, as well as an exacerbation of existing arrhythmias. The nurse must report any new arrhythmia or exacerbation of an existing arrhythmia to the primary health care provider immediately.

Some of the antiarrhythmic drugs may cause dizziness and light-headedness, especially during early therapy. The nurse provides assistance to patients not on complete bed rest with ambulatory activities until these symptoms are no longer present.

Gerontologic Alert

When older adults take the antiarrhythmic drugs, they are at greater risk for adverse reactions such as the development of additional arrhythmias or aggravation of existing arrhythmias, hypotension, and congestive heart failure (CHF). A dosage reduction may be indicated. Careful monitoring by the nurse is necessary for early identification and management of adverse reactions. The nurse monitors the intake and output and reports any signs of CHF, such as increase in weight, decrease in urinary output, or shortness of breath.

Some antiarrhythmic drugs such as quinidine, procainamide, mexiletine, tocainide, or verapamil may cause agranulocytosis. The nurse reports any signs of agranulocytosis such as fever, chills, sore throat, or unusual bleeding or bruising. A complete blood count is usually ordered every 2 to 3 weeks during the first 3 months of therapy. If a decrease in the blood levels of leukocytes, platelets, or hematocrit occurs, use of the drug is discontinued. Blood levels usually return to normal within 1 month after use of the antiarrhythmic drug is discontinued.

ADMINISTERING QUINIDINE. The nurse monitors the patient for the most common adverse reactions seen with quinidine, which include nausea, vomiting, abdominal pain, diarrhea, or anorexia. **Cinchonism** is the term used to describe quinidine toxicity, and it occurs with high blood levels of quinidine (> 8 μg/mL). The nurse must report any quinidine levels greater than 8 μg/mL and the occurrence of any of the following signs or symptoms of cinchonism: ringing in the ears (tinnitus), hearing loss, headache, nausea, dizziness, vertigo, and light-headedness. These symptoms may also appear after a single dose. The patient is kept in a supine position throughout IV administration to minimize hypotension. If a widening of the QRS complex of 50% or more occurs, the nurse immediately notifies the primary care provider, who may order that the drug therapy be discontinued.

ADMINISTERING PROCAINAMIDE. Adverse reactions with procainamide therapy include nausea, loss of appetite, and vomiting. Small meals eaten frequently may be better tolerated than three full meals. Administering the drug with meals may decrease gastrointestinal effects.

ADMINISTERING DISOPYRAMIDE. Because of the cholinergic blocking effects of disopyramide (see Chap. 25), urinary retention may occur. The nurse monitors the urinary output closely, especially during the initial period of therapy. If the patient's intake is sufficient but the output is low, the lower abdomen is

palpated for bladder distention. If urinary retention occurs, catheterization may be necessary.

Dryness of the mouth and throat caused by the cholinergic blocking action of this drug also may occur. The nurse provides an adequate amount of fluid and instructs the patient to take frequent sips of water to relieve this problem. In addition, postural hypotension may occur during the first few weeks of disopyramide therapy. The patient is advised to make position changes slowly. In some instances, the patient may require assistance in getting out of the bed or chair.

ADMINISTERING LIDOCAINE. Lidocaine is an emergency drug used in the treatment of life-threatening ventricular arrhythmias. Constant cardiac monitoring is essential when this drug is administered by the IV or intramuscular (IM) route. The administration of lidocaine is titrated to the patient's response and within institutional protocols. The nurse must observe the patient closely for signs of respiratory depression, bradycardia, change in mental status, respiratory arrest, convulsions, and hypotension. An oropharyngeal airway and suction equipment are kept at the bedside in case convulsions should occur.

If pronounced bradycardia occurs, the primary health care provider may order emergency measures, such as the administration of IV atropine (see Chap. 25) or isoproterenol (see Chap. 22). Any sudden change in mental state should be reported to the primary health care provider immediately because a decrease in the dosage may be necessary.

The nurse monitors the blood pressure and respiratory rate every 2 to 5 minutes when the drug is given IV and every 5 to 10 minutes when the drug is given IM. The pulse rate and rhythm are monitored continually by means of the cardiac monitor. The primary health care provider is contacted immediately if there are any changes in the vital signs or the ECG pattern or if respiratory problems or convulsions occur.

ADMINISTERING TOCAINIDE AND MEXILETINE. The dosage of these drugs must be individualized; therefore, the nurse monitors vital signs at frequent intervals during initial therapy. The nurse reports any changes in the pulse rate or rhythm to the primary health care provider. Onset of tremors is an indicator the maximum dosage of both tocainide and mexiletine has been reached. Adverse effects related to the central nervous system or gastrointestinal tract may occur during initial therapy and must be reported to the primary health care provider.

ADMINISTERING FLECAINIDE AND PROPAFENONE. When administering flecainide, the nurse must carefully monitor the patient for cardiac arrhythmias. Therapeutic serum levels fall between 0.2 and 1 μg/mL. Life support equipment, including pacemaker, should be kept on stand-by during administration.

During the initiation of therapy, patients taking propafenone must be monitored carefully. To minimize adverse reactions, dosage is increased slowly at a minimum of 3- to 4-day intervals. Periodic ECG monitoring is necessary to evaluate the effects on cardiac conduction.

ADMINISTERING PROPRANOLOL. The nurse monitors the ECG frequently for cardiac arrhythmias. Patients receiving IV propranolol must have continuous cardiac monitoring. The nurse must monitor the blood pressure and pulse frequently during the dosage adjustment period and periodically throughout therapy.

ADMINISTERING BRETYLIUM. The nurse monitors cardiac rhythm and blood pressure continuously during administration. Hypotension and postural hypotension occur in about 50% of the patients receiving bretylium. If systolic pressure is less than 75 mm Hg, the nurse should notify the primary health care provider. The patient is kept supine until tolerance of postural hypotension develops. The nurse instructs the patient to change position slowly. Most individuals adjust to blood pressure changes within a few days.

ADMINISTERING VERAPAMIL. The nurse monitors the patient's blood pressure and cardiac rhythm carefully while the drug is being titrated (dosage increased or decreased based on an established criteria by the primary care provider). Dosage may be increased more rapidly in a hospitalized setting. The nurse must assess the cardiac rhythm (ECG) regularly during stabilization of the dosage and periodically during long-term therapy.

Educating the Patient and Family

The nurse explains the adverse drug effects that may occur to the patient and family. To ensure compliance with the prescribed drug regimen, the nurse emphasizes the importance of taking these drugs exactly as prescribed. It may be necessary to teach the patient or a family member how to take the pulse rate. The nurse advises the patient to report any changes in the pulse rate or rhythm to the primary health care provider (see Patient and Family Teaching Checklist: Self-Monitoring Pulse Rate With Antiarrhythmic Therapy).

The nurse emphasizes the following points when teaching the patient and the family:

- Take the drug at the prescribed intervals. Do not omit a dose or increase or decrease the dose unless advised to do so by the primary health care provider. Do not stop taking the drug unless advised to do so by the primary health care provider.
- Do not take any nonprescription drug unless the use of a specific drug is approved by the primary health care provider.

Patient and Family Teaching Checklist

Self-Monitoring Pulse Rate With Antiarrhythmic Therapy

The nurse:

- ✓ Explains the purpose of self-monitoring of pulse rate when receiving antiarrhythmic therapy.
- ✓ Instructs in importance of drug therapy and taking drug exactly as prescribed.
- ✓ Provides written instruction for monitoring pulse rate (see Home Care Checklist: Monitoring Pulse Rate in Chap. 39).
- ✓ Encourages self-monitoring before each dose.
- ✓ Reviews acceptable pulse rate ranges for taking the drug, both verbally and in writing.
- ✓ Encourages recording of pulse rates in a log.
- ✓ Emphasizes need to notify primary care provider should rate fall outside acceptable range or rhythm changes.
- ✓ Reassures that results of therapy will be monitored by periodic laboratory and diagnostic tests and follow-up visits with primary health care provider.
- ✓ Assists with arrangements for follow-up as necessary.

- Avoid drinking alcoholic beverages or smoking unless these have been approved by the primary health care provider.
- Follow the directions on the drug label, such as taking the drug with food.
- Do not chew tablets or capsules; instead, swallow them whole.
- Do not attempt to drive or perform hazardous tasks if light-headedness or dizziness should occur.
- Notify the primary health care provider as soon as possible should any adverse effects occur.
- If a dry mouth should occur, take frequent sips of water, allow ice chips to dissolve in the mouth, or chew (sugar-free) gum.
- Remember that the wax matrix of sustained-release tablets of procainamide (Procan SR only) is not absorbed by the body and may be found in the stool. This is normal.
- Keep all appointments with the primary health care provider, clinic, or laboratory because therapy will be closely monitored.
- If you have diabetes and are taking propranolol, adhere to the prescribed diet and check the blood glucose levels one to two times a day (or as recommended by the primary health care provider). Report elevated glucose levels to the primary health care provider as soon as possible because an adjustment in the dosage of insulin or oral hypoglycemic drugs may be necessary.
- Keep all follow-up visits with the primary health care provider to monitor progress.

EVALUATION

- The therapeutic response is achieved and the arrhythmia is controlled.
- Adverse reactions are identified, reported to the primary health care provider, and managed successfully with appropriate nursing interventions.
- No evidence of injury is seen.
- The patient and family demonstrate an understanding of the drug regimen.
- The patient verbalizes the importance of continued follow-up care.
- The patient verbalizes the importance of complying with the prescribed treatment regimen.
- The patient complies with the prescribed drug regimen.

● Critical Thinking Exercises

1. *Mr. Parker is at an outpatient clinic for a follow-up visit. He has been taking quinidine for several months for a cardiac arrhythmia. Analyze what assessments you would make on Mr. Parker to determine the effectiveness of quinidine therapy. Discuss what questions you would ask to determine the presence of any adverse reactions.*
2. *Ms. Grady, age 48 years, will be discharged in 2 days. The primary health care provider has prescribed propranolol to treat her arrhythmia. Develop a patient educational handout for Ms. Grady to take home with her explaining the most important points for her to know when taking propranolol.*
3. *Mr. Summers has a ventricular arrhythmia and is placed on a cardiac monitor. The primary health care provider prescribes IV lidocaine. Discuss preadministration assessments you would perform on Mr. Summers. Analyze which adverse reactions would be most important to monitor for during the ongoing assessment. Determine what reactions should be reported immediately.*
4. *Ms. Walters is receiving bretylium for a ventricular arrhythmia. Discuss the ongoing assessments you would make when caring for Ms. Walters.*

● Review Questions

1. Which of the following adverse reactions of lidocaine (Xylocaine) should be reported immediately to the primary care provider?
   - **A.** Sudden change in mental status
   - **B.** Dry mouth
   - **C.** Occipital headache
   - **D.** Light-headedness

2. Which of the following drugs, when given with quinidine (Quinidex), would increase the risk for hypotension?
   - **A.** Verapamil (Calan)
   - **B.** Propranolol (Inderal)
   - **C.** Encainide (Enkaid)
   - **D.** Disopyramide (Norpace)

3. Common adverse reactions of the antiarrhythmic drugs include _____.
   - **A.** light-headedness, hypotension, and weakness
   - **B.** headache, hypertension, and lethargy
   - **C.** weakness, lethargy, and hyperglycemia
   - **D.** anorexia, gastrointestinal upset, and hypertension

4. When administering lidocaine (Xylocaine), the nurse reports a blood level greater than _____.
   - **A.** 2 μg/mL
   - **B.** 3 μg/mL
   - **C.** 4 μg/mL
   - **D.** 6 μg/mL

5. Which of the following statements would the nurse include in a teaching plan for the patient taking an antiarrhythmic drug on an outpatient basis?
   - **A.** Take the drug without regard to meals.
   - **B.** Limit fluid intake during the evening hours.
   - **C.** Avoid drinking alcoholic beverages unless their consumption has been approved by the primary care provider.
   - **D.** Eat a diet high in potassium.

● *Medication Dosage Problems*

1. The primary care provider prescribed 75 mg of bretylium IV. The drug is available for injection in vials of 50 mg/mL. The nurse prepares _____.

2. Disopyramide 200 mg PO is prescribed. The pharmacy sends disopyramide (Norpace) 100 mg tablets. The nurse administers _____.