# Glossary

**Absolute refractory period** Corresponds with the onset of the QRS complex to approximately the peak of the T wave; cardiac cells cannot be stimulated to conduct an electrical impulse, no matter how strong the stimulus

**Accelerated idioventricular rhythm (AIVR)** Dysrhythmia originating in the ventricles with a rate between 41 and 100 beats/min

**Action potential** A five-phase cycle that reflects the difference in the concentration of charged particles across the cell membrane at any given time

**Acute coronary syndrome (ACS)** A term used to refer to distinct conditions caused by a similar sequence of pathologic events—a temporary or permanent blockage of a coronary artery; these conditions are characterized by an excessive demand or inadequate supply of oxygen and nutrients to the heart muscle associated with plaque disruption, thrombus formation, and vasoconstriction. ACSs consist of three major syndromes: unstable angina (UA), non–ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI).

**Adrenergic** Having the characteristics of the sympathetic division of the autonomic nervous system

**Afterload** The pressure or resistance against which the ventricles must pump to eject blood

**Agonal rhythm** Dysrhythmia similar in appearance to an idioventricular rhythm but occurring at a rate of less than 20 beats/min; dying heart

**Altered automaticity** A disorder of impulse formation in which cardiac cells fire and initiate impulses before a normal sinoatrial node impulse

**Amplitude** Height (voltage) of a waveform on the ECG

**Angina pectoris** Chest discomfort or other related symptoms of sudden onset that may occur because the increased oxygen demand of the heart temporarily exceeds the blood supply

**Aortic valve** Semilunar valve on the left side of the heart; separates the left ventricle from the aorta

**Apex of the heart** Lower portion of the heart that is formed by the tip of the left ventricle

**Arrhythmia** Abnormal heart rhythm

**Arteriosclerosis** A chronic disease of the arterial system characterized by abnormal thickening and hardening of the vessel walls

**Artifact** Distortion of an ECG tracing by electrical activity that is noncardiac in origin (e.g., electrical interference, poor electrical conduction, patient movement)

**Asystole** A total absence of ventricular electrical activity

**Atherosclerosis** A form of arteriosclerosis in which the thickening and hardening of the vessel walls are caused by a buildup of fatty deposits in the inner lining of large and middle-sized muscular arteries (from *athero*, meaning "gruel" or "paste," and *sclerosis*, meaning "hardness")

**Atria** Two upper chambers of the heart (singular, atrium)

**Atrial kick** Blood pushed into the ventricles because of atrial contraction

**Atrioventricular (AV) block** A delay or interruption in impulse conduction from the atria to the ventricles that occurs as a result of a transient or permanent anatomic or functional impairment

**Atrioventricular bundle** The bundle of His

**Atrioventricular node** A group of cells that conduct an electrical impulse through the heart; located in the floor of the right atrium immediately behind the tricuspid valve and near the opening of the coronary sinus

**Atrioventricular valve** Valve located between each atrium and ventricle; the tricuspid separates the right atrium from the right ventricle, and the mitral (bicuspid) separates the left atrium from the left ventricle

**Atypical presentation** Uncharacteristic signs and symptoms perceived by some patients experiencing a medical condition, such as an acute coronary syndrome

**Augmented limb lead** Leads aVR, aVL, and aVF; these leads record the difference in electrical potential at one location relative to zero potential rather than relative to the electrical potential of another extremity

**Automated external defibrillator (AED)** A machine with a sophisticated computer system that analyzes a patient's heart rhythm using an algorithm to distinguish shockable rhythms from nonshockable rhythms and provides visual and auditory instructions to the rescuer to deliver an electrical shock, if indicated

**Automaticity** Ability of cardiac pacemaker cells to spontaneously initiate an electrical impulse without being stimulated from another source (such as a nerve)

**AV bundle** The bundle of His

**AV dissociation** Any dysrhythmia in which the atria and ventricles beat independently (e.g., ventricular tachycardia, third-degree AV block)

**AV interval** In dual-chamber pacing, the length of time between an atrial sensed or atrial paced event and the delivery of a ventricular pacing stimulus; analogous to the PR interval of intrinsic waveforms; also called the artificial or electronic PR interval

**AV node** Specialized cells located in the lower portion of the right atrium; delays the electrical impulse to allow the atria to contract and complete filling of the ventricles

**Axis** Imaginary line joining the positive and negative electrodes of a lead

**Base of the heart** Posterior surface of the heart

**Base rate** Rate at which the pacemaker's pulse generator initiates impulses when no intrinsic activity is detected; expressed in pulses/minute (ppm)

**Baseline** Straight line recorded on ECG graph paper when no electrical activity is detected

**Biphasic** Waveform that is partly positive and partly negative

**Bipolar limb lead** ECG lead consisting of a positive and negative electrode

**Blood pressure** Force exerted by the blood against the walls of the arteries as the ventricles of the heart contract and relax

**Bundle branch block (BBB)** A disruption in impulse conduction from the bundle of His through the right or left bundle branch to the Purkinje fibers; a BBB may be intermittent or permanent

**Bundle of His** Fibers located in the upper portion of the interventricular septum that receive an electrical impulse from the AV node and conduct the impulse to the right and left bundle branches

**Burst** Three or more sequential ectopic beats; also referred to as a *salvo* or *run*

**Capture** The successful conduction of an artificial pacemaker's impulse through the myocardium, resulting in depolarization

**Cardiac output** The amount of blood pumped into the aorta each minute by the heart; defined as the stroke volume multiplied by the heart rate

**Catecholamines** Natural chemicals produced by the body that have sympathetic actions; epinephrine, norepinephrine, dopamine

**Cholinergic** Having the characteristics of the parasympathetic division of the autonomic nervous system

**Chordae tendineae (tendinous cords)** Thin strands of fibrous connective tissue that extend from the AV valves to the papillary muscles that prevent the AV valves from bulging back into the atria during ventricular systole (contraction)

**Chronotropy** A change in (heart) rate

**Circumflex artery** Division of the left coronary artery

**Coarse ventricular fibrillation** Ventricular fibrillation with fibrillatory waves greater than 3 mm in height

**Complex** Several waveforms

**Conduction system** A system of pathways in the heart composed of specialized electrical (pacemaker) cells

**Conductivity** Ability of a cardiac cell to receive an electrical stimulus and conduct that impulse to an adjacent cardiac cell

**Contractility** Ability of cardiac cells to shorten, causing cardiac muscle contraction in response to an electrical stimulus

**Coronary sinus** Outlet that drains five coronary veins into the right atrium

**Couplet** Two consecutive complexes

**Current** The flow of an electrical charge from one point to another

**Defibrillation** Delivery of an electrical current across the heart muscle over a very brief period to terminate an abnormal heart rhythm; also called *unsynchronized countershock* or *asynchronous countershock* because the delivery of current has no relationship to the cardiac cycle

**Delta wave** Slurring of the beginning portion of the QRS complex, caused by preexcitation

**Demand pacemaker** Pacemaker that discharges only when the patient's heart rate drops below the preset rate for the pacemaker; also known as a *synchronous* or *noncompetitive pacemaker*

**Depolarization** Movement of ions across a cell membrane, causing the inside of the cell to become more positive; an electrical event expected to result in contraction

**Diastole** Phase of the cardiac cycle in which the atria and ventricles relax between contractions and blood enters these chambers; when the term is used without reference to a specific chamber of the heart, the term implies ventricular diastole

**Dromotropy** Refers to the speed of conduction through the AV junction

**Dual-chamber pacemaker** Pacemaker that stimulates the atrium and ventricle; dual-chamber pacing is also called *physiologic pacing*

**Dysrhythmia** Any disturbance or abnormality in a normal rhythmic pattern; any cardiac rhythm other than a sinus rhythm

**Ectopic** Impulse(s) originating from a source other than the sinoatrial node

**Effective refractory period** Period of the cardiac action potential that includes the absolute refractory period and the first half of the relative refractory period

**Ejection fraction** The percentage of blood pumped out of a heart chamber with each contraction

**Electrode** An adhesive pad that contains a conductive gel and is applied at specific locations on the patient's chest wall and extremities and connected by cables to an ECG machine

**Electrolytes** Elements or compounds that break into charged particles (ions) when melted or dissolved in water or another solvent

**Endocardium** Innermost layer of the heart that lines the inside of the myocardium and covers the heart valves

**Enhanced automaticity** Abnormal condition in which cardiac cells not normally associated with the property of automaticity begin to depolarize spontaneously or when escape pacemaker sites increase their firing rate beyond that considered normal

**Epicardium** Also known as the *visceral pericardium*; the external layer of the heart wall that covers the heart muscle

**Escape interval** Time measured between a sensed cardiac event and the next pacemaker output

**Excitability** The ability of cardiac muscle cells to respond to an outside stimulus

**f waves** Fibrillation waves; irregularly shaped atrial waves associated with atrial fibrillation, occurring at a rate of 400 to 600 beats/min

**F waves** Flutter waves; atrial waves associated with atrial flutter; usually shaped like the teeth of a saw or a picket fence

**Failure to capture** A pacemaker malfunction that occurs when the artificial pacemaker stimulus is unable to depolarize the myocardium

**Failure to pace** A pacemaker malfunction that occurs when the pacemaker fails to deliver an electrical stimulus at its programmed time; also referred to as *failure to fire* or *failure of pulse generation*

**Fine ventricular fibrillation** VF with fibrillatory waves less than 3 mm in height

**Fixed-rate pacemaker** Pacemaker that continuously discharges at a preset rate regardless of the patient's intrinsic activity; also known as an *asynchronous pacemaker*

**Focal atrial tachycardia** AT that begins in a small area (focus) within the heart

**Fusion beat** Beat that occurs because of simultaneous activation of one cardiac chamber by two sites (foci); in pacing, the ECG waveform that results when an intrinsic depolarization and a pacing stimulus occur simultaneously and both contribute to depolarization of that cardiac chamber

**Great vessels** Large vessels that carry blood to and from the heart superior and inferior venae cavae, pulmonary veins, aorta, and pulmonary trunk

**Ground electrode** Third ECG electrode (the first and second are the positive and negative electrodes), which minimizes electrical activity from other sources

**Heart failure** A condition in which the heart is unable to pump enough blood to meet the metabolic needs of the body; it may result from any condition that impairs preload, afterload, cardiac contractility, or heart rate

**His-Purkinje system** Portion of the conduction system consisting of the bundle of His, bundle branches, and Purkinje fibers

**Hypovolemia** Inadequate tissue perfusion caused by inadequate vascular volume

**Indicative changes** ECG changes observed in leads that look directly at the affected area of the heart; indicative changes are significant when they are seen in two anatomically contiguous leads.

**Infarction** Death of tissue because of an inadequate blood supply

**Inherent** Natural, intrinsic

**Inhibition** Pacemaker response in which the output pulse is suppressed when an intrinsic event is sensed

**Inotropy** Refers to a change in myocardial contractility

**Interpolated PVC** PVC that occurs between two normally conducted QRS complexes and that does not disturb the next ventricular depolarization or sinoatrial node activity

**Interval** Waveform and a segment; in pacing, the period, measured in milliseconds, between any two designated cardiac events

**Intrinsic rate** Rate at which a pacemaker of the heart normally generates impulses

**Ion** Electrically charged particle

**Ischemia** Decreased supply of oxygenated blood to a body part or organ

**Isoelectric line** Absence of electrical activity; observed on the ECG as a straight line

**J-point** Point where the QRS complex and ST segment meet

**Junctional bradycardia** A rhythm that begins in the AV bundle with a rate of less than 40 beats/min

**Junctional escape rhythm** A rhythm that begins in the AV bundle; characterized by a very regular ventricular rate of 40 to 60 beats/min

**Junctional tachycardia** A rhythm that begins in the AV bundle with a ventricular rate of more than 100 beats/min

**Lead** Electrical connection attached to the body to record electrical activity

**Left anterior descending artery** Division of the left coronary artery

**Mediastinum** Middle area of the thoracic cavity; contains the heart, great vessels, trachea, and esophagus, among other structures; extends from the sternum to the vertebral column

**Membrane potential** Difference in electrical charge across the cell membrane

**Millivolt (mV)** Difference in electrical charge between two points in a circuit

**Mitochondria** The energy-producing parts of a cell

**Monomorphic** Having the same shape

**Multiformed atrial rhythm** Dysrhythmia that occurs because of impulses originating from various sites, including the SA node, the atria, and/or the AV junction; requires at least three different P waves, seen in the same lead, for proper diagnosis

**Myocardial cells** Working cells of the myocardium that contain contractile filaments and form the muscular layer of the atrial walls and the thicker muscular layer of the ventricular walls

**Myocardium** Middle and thickest layer of the heart; contains the cardiac muscle fibers that cause contraction of the heart and contains the conduction system and blood supply

**Myofibril** Slender, striated strand of muscle tissue

**Neurotransmitter** A chemical released from one nerve that crosses the synaptic cleft to reach a receptor

**Nonconducted PAC (blocked PAC)** Premature atrial complex that is not followed by a QRS complex

**Noncompensatory pause** A pause that often follows a premature atrial complex that represents the delay during which the SA node resets its rhythm for the next beat; the pause is noncompensatory if the normal beat following the premature complex occurs before it was expected (i.e., the period between the complex before and after the premature beat is less than two normal R-R intervals)

**Oversensing** A pacemaker malfunction that results from inappropriate sensing of extraneous electrical signals

**P wave** First wave in the cardiac cycle; represents atrial depolarization and the spread of the electrical impulse throughout the right and left atria

**Paced interval** Period between two consecutive paced events in the same cardiac chamber; also known as the *automatic interval*

**Pacemaker** A battery-powered device that delivers an electrical current to the heart to stimulate depolarization

**Pacemaker cells** Specialized cells of the heart's electrical conduction system, capable of spontaneously generating and conducting electrical impulses

**Paired beats** Two consecutive complexes

**Palpitations** An unpleasant awareness of one's heartbeat

**Paroxysmal atrial tachycardia (PAT)** AT that starts or ends suddenly

**Paroxysmal supraventricular tachycardia (PSVT)** A regular, narrow-QRS tachycardia that starts or ends suddenly; also called *paroxysmal atrial tachycardia (PAT)*

**Pericardium** A double-walled sac that encloses the heart and helps protect it from trauma and infection

**Peripheral resistance** Resistance to the flow of blood determined by blood vessel diameter and the tone of the vascular musculature

**Permeability** Ability of a membrane channel to allow passage of electrolytes once it is open

**Polarized state** Period after repolarization of a myocardial cell (also called the *resting state*) when the outside of the cell is positive and the interior of the cell is negative

**Polymorphic** Varying in shape

**Preexcitation** Term used to describe rhythms that originate from above the ventricles but in which the impulse travels by a pathway other than the AV node and bundle of His; thus the supraventricular impulse excites the ventricles earlier than normal

**Preload** Force exerted by the blood on the walls of the ventricles at the end of diastole

**Premature complex** Early beat occurring before the next expected beat; can be atrial, junctional, or ventricular

**PR interval** P wave plus the PR segment; reflects depolarization of the right and left atria (P wave) and the spread of the impulse through the AV node, AV bundle, right and left bundle branches, and the Purkinje fibers (PR segment)

**Prophylaxis** Preventive treatment

**Proximal** Location nearer to the midline of the body or the point of attachment than something else is

**Pulmonary circulation** Flow of unoxygenated (venous) blood from the right ventricle to the lungs and oxygenated blood from the lungs to the left atrium

**Purkinje fibers** Fibers found in both ventricles that conduct an electrical impulse through the heart

**QRS complex** Several waveforms (i.e., the Q wave, the R wave, and the S wave) that represent the spread of an electrical impulse through the ventricles (i.e., ventricular depolarization)

**Quadrigeminy** Dysrhythmia in which every fourth beat is a premature ectopic beat

**R wave** On an EGG, the first positive deflection in the QRS complex, representing ventricular depolarization; in pacing, R wave refers to the entire QRS complex, denoting an intrinsic ventricular event

**Reciprocal change** ECG changes observed in leads opposite the affected area of the heart; also called *mirror image* changes

**Reentry** Spread of an impulse through tissue already stimulated by that same impulse.

**Refractoriness** Period of recovery that cells need after being discharged before they are able to respond to a stimulus

**Relative refractory period** Corresponds with the downslope of the T wave; cardiac cells can be stimulated to depolarize if the stimulus is strong enough.

**Repolarization** Movement of ions across a cell membrane in which the inside of the cell is restored to its negative charge

**Retrograde** Moving backward; moving in the opposite direction to that which is considered normal

**Run** Three or more sequential ectopic beats; also referred to as a *salvo* or *burst*

**Salvo** Three or more sequential ectopic beats; also referred to as a *run* or *burst*

**Sarcolemma** Membrane that covers smooth, striated, and cardiac muscle fibers

**Sarcomere** Smallest functional unit of a myofibril

**Sarcoplasm** Semifluid cytoplasm of muscle cells

**Sarcoplasmic reticulum** Network of tubules and sacs that plays an important role in muscle contraction and relaxation by releasing and storing calcium ions

**Segment** Line between waveforms; named by the waveform that precedes and follows it

**Semilunar valves** Valves shaped like half-moons that separate the ventricles from the aorta and pulmonary artery

**Sensitivity** The extent to which an artificial pacemaker recognizes intrinsic cardiac electrical activity

**Septum** An internal wall of connective tissue

**Shock** Inadequate tissue perfusion that results from the failure of the cardiovascular system to deliver sufficient oxygen and nutrients to sustain vital organ function

**Sinoatrial (SA) node** Normal pacemaker of the heart that normally discharges at a rhythmic rate of 60 to 100 beats/min

**Sinus arrhythmia** Dysrhythmia originating in the SA node that occurs when the SA node discharges irregularly; sinus arrhythmia is a normal phenomenon associated with the phases of breathing and changes in intrathoracic pressure

**Sinus bradycardia** Dysrhythmia originating in the SA node with a ventricular response of less than 60 beats/min

**Sinus rhythm** A normal heart rhythm; sometimes called a *regular sinus rhythm (RSR)* or *normal sinus rhythm (NSR)*

**Sinus tachycardia** Dysrhythmia originating in the SA node with a ventricular response between 101 and 180 beats/min

**Stroke volume** The amount of blood ejected from a ventricle with each heartbeat

**ST segment** Portion of the ECG representing the end of ventricular depolarization (end of the R wave) and the beginning of ventricular repolarization (T wave)

**Sulcus** Groove

**Supranormal period** Period during the cardiac cycle when a weaker-than-normal stimulus can cause cardiac cells to depolarize; extends from the end of phase 3 to the beginning of phase 4 of the cardiac action potential

**Supraventricular** Originating from a site above the bifurcation of the bundle of His, such as the SA node, atria, or AV junction

**Syncytium** Unit of combined cells

**Systole** Contraction of the heart (usually referring to ventricular contraction) during which blood is propelled into the pulmonary artery and aorta; when the term is used without reference to a specific chamber of the heart, the term implies ventricular systole

**T wave** Waveform that follows the QRS complex and represents ventricular repolarization

**Tone** A term that may be used when referring to the normal state of balanced tension in body tissues

**Torsades de pointes (TdP)** Type of polymorphic VT associated with a prolonged QT interval; the QRS changes in shape, amplitude, and width and appears to "twist" around the isoelectric line, resembling a spindle

**TP segment** Interval between two successive PQRST complexes during which electrical activity of the heart is absent; begins with the end of the T wave through the onset of the following P wave and represents the period from the end of ventricular repolarization to the onset of atrial depolarization

**Trigeminy** Dysrhythmia in which every third beat is a premature ectopic beat

**Triggered activity** A disorder of impulse formation that occurs when escape pacemaker and myocardial working cells fire more than once after stimulation by a single impulse, resulting in atrial or ventricular beats that occur alone, in pairs, in runs, or as a sustained ectopic rhythm

**Undersensing** A pacemaker malfunction that occurs when the artificial pacemaker fails to recognize spontaneous myocardial depolarization

**Unipolar lead** Lead that consists of a single positive electrode and a reference point

**Vagal maneuver** Methods used to stimulate the vagus nerve in an attempt to slow conduction through the AV node, resulting in slowing of the heart rate

**Venous return** Amount of blood flowing into the right atrium each minute from the systemic circulation

**Ventricle** Either of the two lower chambers of the heart

**Ventricular tachycardia (VT)** Dysrhythmia originating in the ventricles with a ventricular response greater than 100 beats/min

**Voltage** Difference in electrical charge between two points

**Wandering atrial pacemaker (multiformed atrial rhythm)** Cardiac dysrhythmia that occurs because of impulses originating from various sites, including the SA node, the atria, and/or the AV junction; requires at least three different P waves, seen in the same lead, for proper diagnosis

**Waveform** Movement away from the baseline in either a positive or negative direction

**Wolff-Parkinson-White syndrome** Type of preexcitation syndrome, characterized by a slurred upstroke of the QRS complex (delta wave) and wide QRS