Pacemakers are used to treat both acute and chronic conduction defects such as third-degree AV block. They also may be used to treat bradydysrhythmias and tachydysrhythmias.

Temporary pacemakers use an external pulse generator (Figure 29–15 ■) attached to a lead threaded intravenously into the right ventricle, to temporary pacing wires implanted during cardiac surgery, or to external conductive pads placed on the chest wall for emergency pacing.

Permanent pacemakers use an internal pulse generator placed in a subcutaneous pocket in the subclavian space or abdominal wall. The generator connects to leads sewn directly onto the heart (epicardial) or passed transvenously into the heart (endocardial). Epicardial pacemakers (Figure 29–16 ■) require surgical exposure of the heart. Leads may be placed during cardiac surgery, or using a small subxiphoid incision to expose on the heart. Transvenous pacemaker leads are positioned in the right heart via the cephalic, subclavian, or jugular vein (Figure 29–17 ■). Local anesthesia can be used for permanent pacer insertion.

Pacemakers are programmed to stimulate the atria or the ventricles (single-chamber pacing), or both (dual-chamber pacing). Table 29–7 defines terms used to describe pacemaker modes and functions. The most commonly used pacemakers either: (a) sense activity in and pace the ventricles only; or (b) sense activity in and pace both the atria and the ventricles. Dual-chamber or atrioventricular sequential pacing stimulates both chambers of the heart in sequence. AV pacing imitates the normal sequence of atrial contraction followed by ventricular contraction, improving cardiac output.

Pacing is detected on the ECG strip by the presence of pacing artifact (Figure 29–18 ■). A sharp spike is noted before the P wave with atrial pacing, and before the QRS complex with ventricular pacing. Pacing spikes are seen before both the P wave and QRS complex in AV sequential pacing. Capture is noted if there is a contraction of the chamber immediately following the pacer spike. Problems in sensing, pacing, and capture are noted in Table 29–8 ■.