# Pacemaker Rhythms

Diagnostic Characteristics

Heart Rate:

-The heart rate produced by a permanently implanted cardiac pacemaker is usually between 60 and 70 beats per minute.

Rhythm:

-ventricular rhythm produced by a pacemaker that is pacing constantly is regular

-may be irregular when the pacemaker is pacing on demand

Pacemaker Site:

-an electrode located in the tip of the pacemaker lead, commonly positioned in the apex of the right ventricular cavity (ventricular pacemaker), in the right atrium (atrial pacemaker), or both (dual chamber pacemaker)

Pacemaker Spikes:

-the electrical discharge from a cardiac pacemaker produces a narrow spike

-a pacemaker lead positioned in the atria produces a pacemaker spike followed by a small, flattened P wave

-a pacemaker lead positioned in the ventricle produces a spike followed by a wide (0.12 second or greater) and bizarre QRS

-a P wave or QRS complex indicates "capture" by the pacemaker

-a pacemaker spike not followed by a P wave or QRS indicates that the pacemaker is discharging, but not capturing

P waves:

-may be present or absent

PR intervals:

-PR intervals of the underlying rhythm may be normal or abnormal depending on the arrhythmia

-the PR intervals in atrial synchronous and dual-paced, AV sequential pacemakers are within normal limits

R-R Intervals:

-equal

-when pacemaker-induced QRS complexes are interspersed with the patient's normal QRS complexes, the R-R intervals will be unequal

QRS Complexes:

-may be normal or abnormal
-pacemaker-induced QRS complexes are greater than 0.12 second and bizarre
-a pacemaker spike will often precede the QRS complex

Clinical Significance:

-a pacemaker rhythm indicates that the patient's heart is being electronically paced
-pacemakers are usually implanted to correct underlying third-degree heart block or episodes of symptomatic bradycardia
-some problems that can occur with pacemakers:

1. presence of spikes that are not followed by P waves or QRS complexes indicates a malfunctioning pacemaker
2. complete absence of pacemaker spikes in the presence of bradycardia or ventricular asystole indicates battery failure
3. a pacemaker spike rate over 300 per minute can occur in older models of pacemakers (low battery power) Called a runaway pacemaker
4. Failure of a demand pacemaker to shut off when the patient has adequate electrical activity of the heart indicates a failure in the pacemaker's sensing circuit (spikes may fall in relative refractory period)