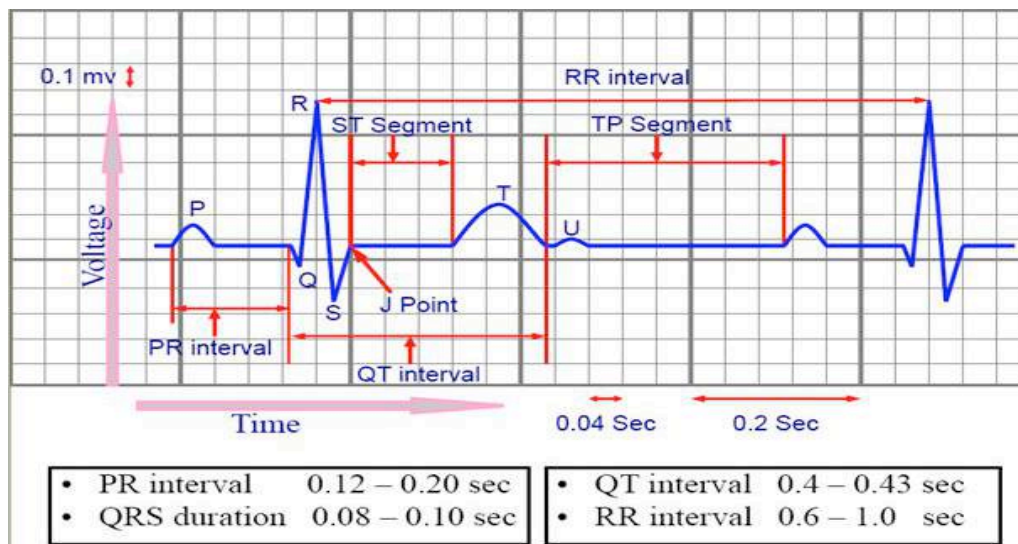
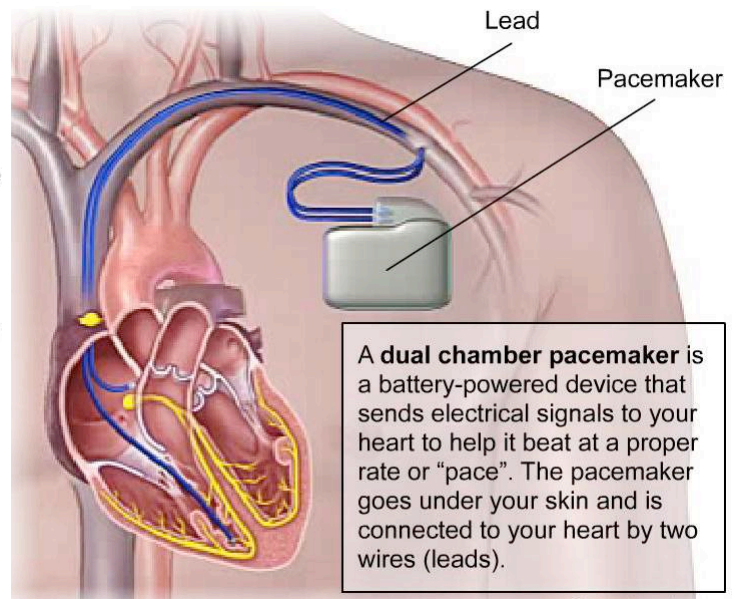
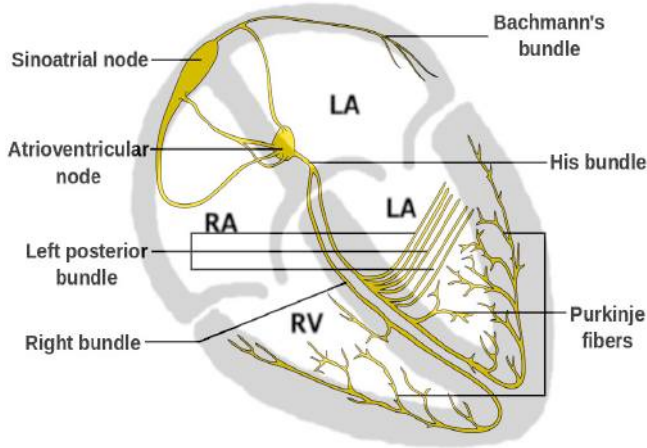


Cardiac Pacemakers

History

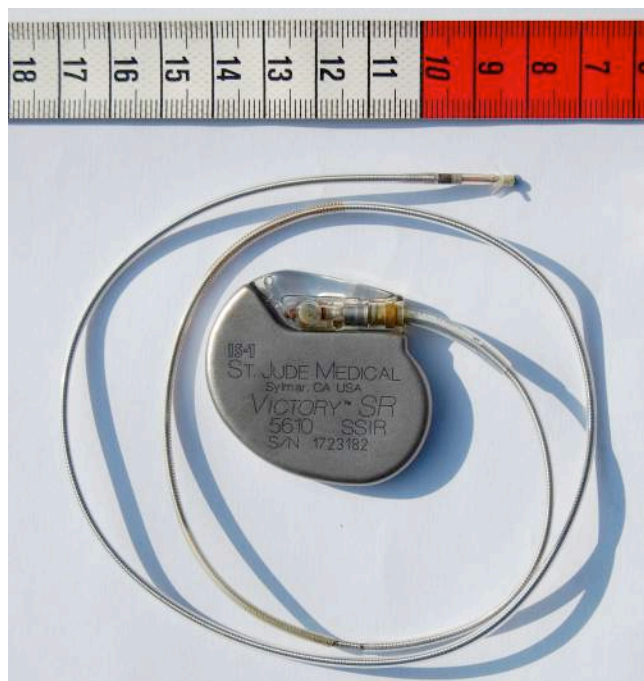
In 1889, John Alexander MacWilliam of England applied an electrical impulse to the human heart in asystole caused a ventricular contraction. In 1926, Dr. Mark C. Lidwill of the Royal Prince Alfred Hospital of Sydney, supported by physicist Edgar H Booth of the University of Sydney, devised a portable apparatus in which "One pole was applied to a skin pad soaked in strong salt solution" while the other pole "consisted of a needle insulated except at its point, and was plunged into the appropriate cardiac chamber". In 1928, the apparatus was used to revive a stillborn infant at Crown Street Women's Hospital, Sydney whose heart continued "to beat on its own accord at the end of 10 minutes" of stimulation. In 1932, American physiologist Albert Hyman described an electro-mechanical instrument powered by a spring-wound hand-cranked motor. Hyman referred to his invention as an "artificial pacemaker", the term continuing in use to this day.



Cardiac Pacemaker Code

I	II	III	IV	V
Chamber(s) Paced	Chamber(s) Sensed	Mode(s) of Response	Programmable Functions	Antitachycardia Functions
V Ventricle	V Ventricle	T Triggered	R Rate Modulated	O None
A Atrium	A Atrium	I Inhibited	C Communicating	P Paced
D Dual (A&V)	D Dual (A&V)	D Dual (T/I)	M Multiprogrammable	S Shocks
O None	O None	O None	P Simple Programmable	D Dual (P&S)
			O None	

From this the basic ventricular "on demand" pacing mode is VVI or with automatic rate adjustment for exercise VVIR – this mode is suitable when no synchronization with the atrial beat is required, as in atrial fibrillation. The equivalent atrial pacing mode is AAI or AAIR which is the mode of choice when atrioventricular conduction is intact but the natural pacemaker the sinoatrial node is unreliable – sinus node disease (SND) or sick sinus syndrome. Where the problem is atrioventricular block (AVB) the pacemaker is required to detect (sense) the atrial beat and after a normal delay (0.1–0.2 seconds) trigger a ventricular beat, unless it has already happened – this is VDD mode and can be achieved with a single pacing lead with electrodes in the right atrium (to sense) and ventricle (to sense and pace). These modes AAIR and VDD are unusual in the US but widely used in Latin America and Europe. The DDDR mode is most commonly used as it covers all the options though the pacemakers require separate atrial and ventricular leads and are more complex, requiring careful programming of their functions for optimal results.



An artificial pacemaker with electrode for transvenous insertion. The body of the device is about 3–4 cm long, the electrode measures between 50 and 60 cm (20 to 24 inches).