Rhythm Packet

Normal ECG Criteria

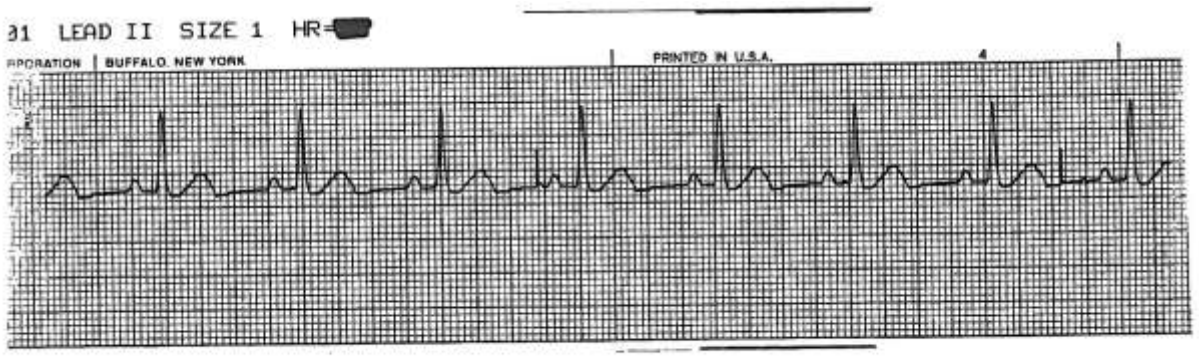
Part	Time (sec.)	Description	Abnormal
P wave	< 0.10	Atrial depolarization	Atrial hypertrophy: ↑ amplitude or width
PR Interval	0.12-0.20	Time required for atrial depolarization and conduction through AV node	Diseased AV node Ischemia Drug effects ↑ Vagal tone
QRS Complex	0.06-0.10	Entire ventricular depolarization Atrial repolarization occurs, but is obstructed by QRS	Intraventicular conduction delays WPW syndrome Hyperkalemia
ST Segment	Isoelectric	Initial ventricular repolarization	Hypocalcemia; prolonged Pericarditis, injury, infarction; elevated Subendocardial injury or ischemia, electrolyte disturbances, drugs; depressed
T Wave		Ventricular repolarization	Infarctions, ischemia, injury, hypertrophy; inverted Hyperkalemia, acute injury; tall-peaked
QT Interval	Corrected for heart rate < 0.44 males < 0.45 females	Ventricular depolarization and repolarization	Ischemia, electrolyte imbalances, hypertrophy, antiarrhythmic drugs; prolonged Acute ischemia, hypercalcemia, drugs; shortened

Lead Selection

Leads with ECG Changes	**Injury/Infarct Related Artery**	**Area of Damage**	**Associated Complications**
V1-V2	Left coronary artery: left anterior descending septal branch	Septum, His bundle, bundle branches	Infranodal block and bundle branch blocks
V3-V4	Left coronary artery: left anterior descending diagonal branch	Anterior	Left ventricle dysfunction, CHF, bundle branch blocks, complete heart block, PVCs, ventricular septum rupture
V5-V6, I, aVL	Left coronary artery: circumflex branch	High lateral	Left ventricle dysfunction, AV nodal block in some
II, III, aVF	Right coronary artery: posterior descending branch	Inferior, Posterior	Conduction disturbances; if hypotension occurs, suspect right ventricular MI
V1-V4	Either left coronary artery – circumflex OR right coronary after – posterior descending branch	Posterior wall	Left ventricular dysfunction
V4 right (II, III, aVF)	Right coronary artery: proximal branches	Right ventricle, inferior and posterior wall left ventricle	Usually accompanies inferior MI, hypotension, sensitivity to nitroglycerin and morphine sulfate, jugular venous distension with clear lung fields supranodal and AV nodal blocks, atrial fibrillation/flutter, PACs

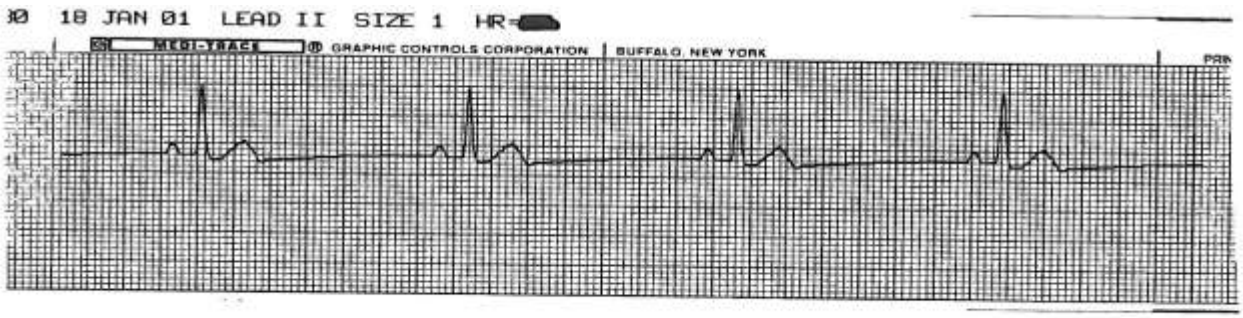
Sinus Rhythm

Rate:	60 to 100
P waves:	Precede each QRS
PR Interval:	Normal, 0.12-0.20
QRS Complex:	Usually normal, 0.40-0.10
Conduction	Conduction through atria, AV node, and ventricles is normal
Rhythm:	Regular
Causes:	Normal
Treatment:	Usually nothing



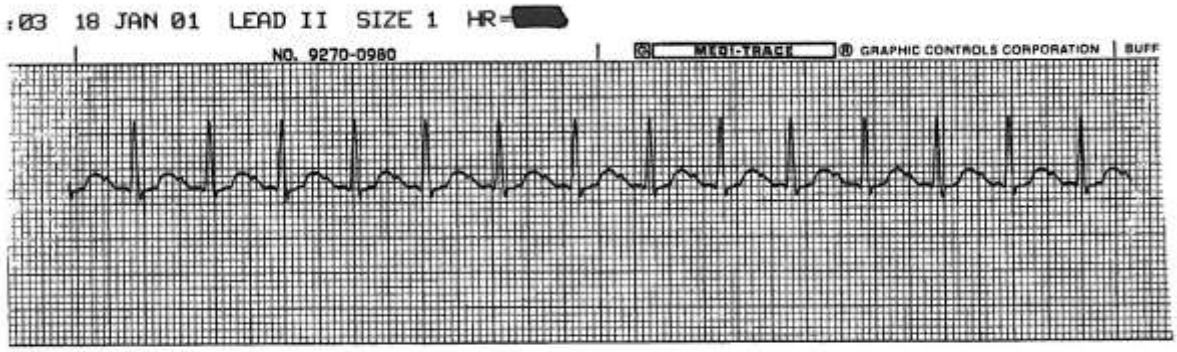
Sinus Bradycardia

Rate:	40-60
P waves:	Precede each QRS,
PR Interval:	Usually normal
QRS Wave:	Usually normal
Conduction	Usually normal
Rhythm:	Regular
Causes:	Vagal stimulation Hypoxia Reduced cardiac output Drugs
Treatment:	Determine if symptomatic or normal If symptomatic give Atropine, if ineffective consider Transcutaneous Pacing Dopamine infusion Epinephrine infusion Consider expert consultation and transvenous pacing



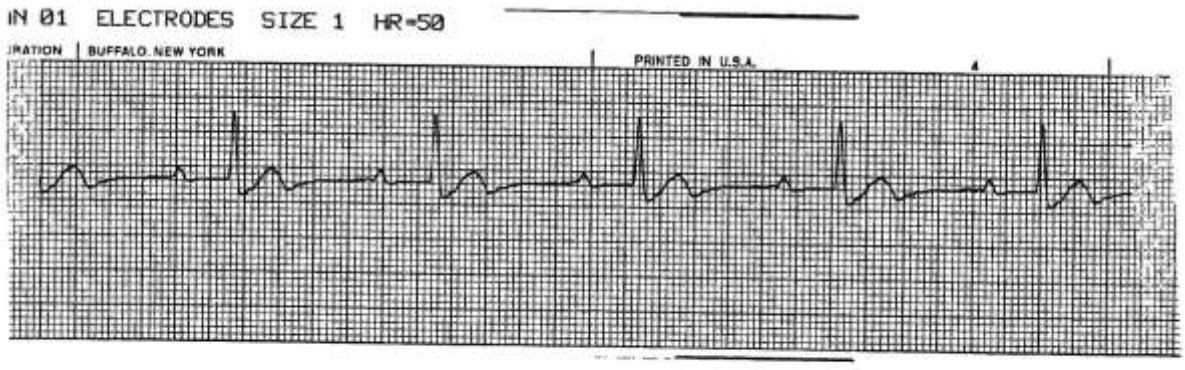
Sinus Tachycardia

Rate:	100-150
P waves:	Precede each QRS. May be buried in the preceding T wave.
PR Interval:	Usually normal
QRS Complex:	Usually normal
Conduction	Usually normal
Rhythm:	Regular
Causes:	Pain Sympathetic stimulation Cardiac Noncardiac Drugs
Treatment:	Treat underlying cause Calcium channel blockers Beta blockers



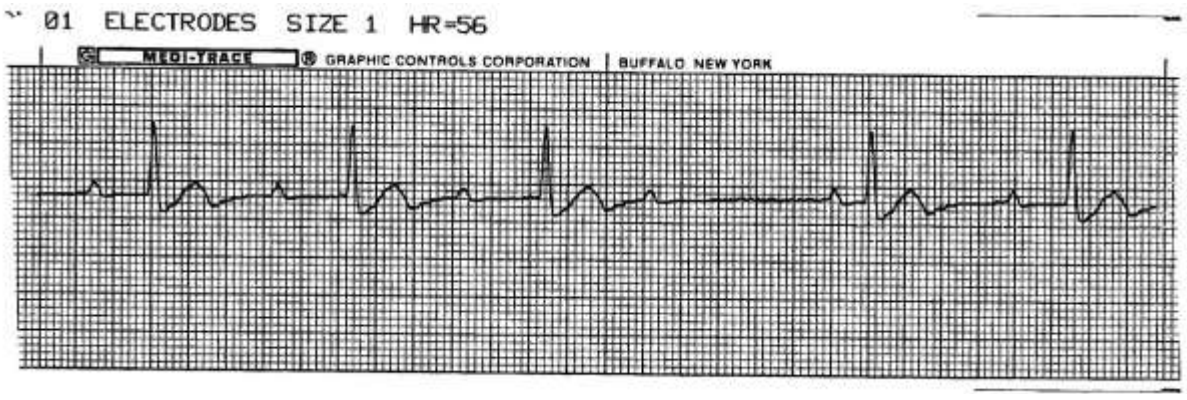
SR First Degree AV Block

Rate:	60-100 minute
P waves:	Precede each QRS
PR Interval:	> 0.20 seconds and constant
QRS Complex:	Usually normal
Conduction:	Prolonged through AV node, usually normal through bundle branches
Rhythm:	Usually regular, rate may be variable
Causes:	Drugs that slow conduction (digitalis) Ischemia, MI Increase parasympathetic tone
Treatment:	Usually none Watch for further block



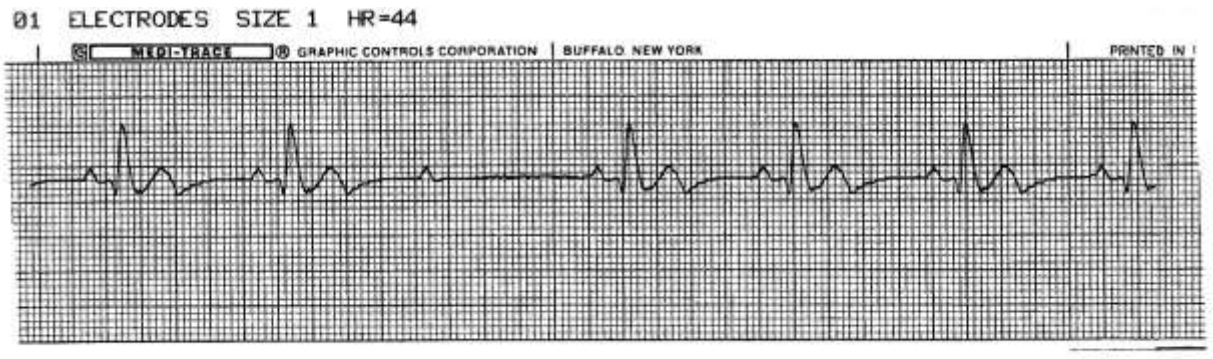
SR Second Degree AV Block Type 1 (Wenckebach)

Rate:	60-100 minute
P waves:	Precede each QRS, until an atrial impulse is blocked.
PR Interval:	Progressively longer until a P wave fails to conduct.
QRS Complex:	Usually normal
Conduction:	Progressive increase in conduction time through the AV node until an atrial impulse is blocked
Rhythm:	“Group beating” appearance
Causes:	MI, drugs, Post CABD, electrolyte imbalance
Treatment:	Monitor, usually temporary. Treat if symptomatic



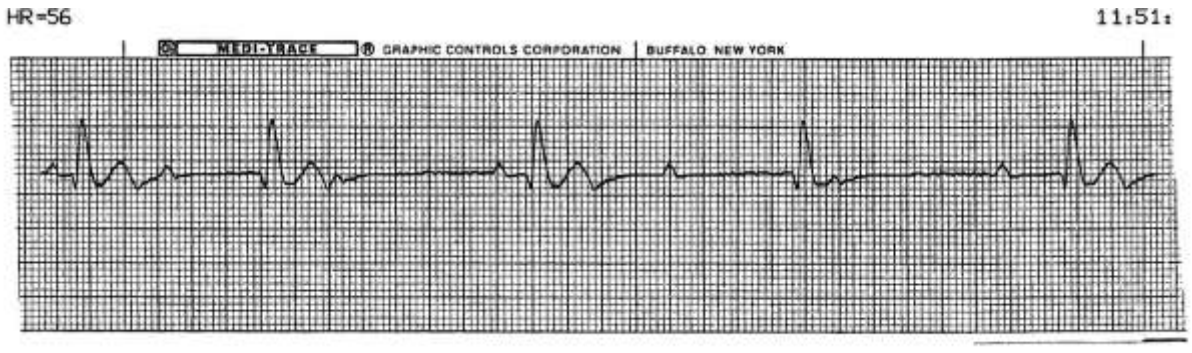
SR Second Degree AV Block Type II

Rate:	30-55
P waves:	Precede each QRS until sudden blockage of atrial beat.
PR Interval:	May be prolonged, constant
QRS Complex:	May be prolonged if also bundle branch block
Conduction:	Consistent conduction times through the AV node until an atrial impulse is blocked. Frequently associated with a bundle branch block.
Rhythm:	Irregular
Causes:	Indicates pathology below the AV node. MI, ischemia, coronary artery disease, cardiomyopathy
Treatment:	Pacemaker, atropine



Third Degree AV Block
Complete Heart Block

Rate:	Usually less than 40
P waves:	Regular P-P interval, no correlation to QRS.
PR Interval:	Non-existent
QRS Complex:	Regular R-R interval, no correlation to P waves. May be wide.
Conduction:	Normal through atria, all impulses blocked at the AV node, no conduction to ventricles. May be wide, especially if ventricular escape rhythm.
Rhythm:	May appear regular
Causes:	MI; poor prognosis if anterior MI, damage or ischemia to AV node or bundle branches; drugs
Treatment:	If symptomatic. Atropine will be ineffective as it will speed up the atrial rate, but still no conduction to the ventricles. Need a pacemaker.



Bundle Branch Block

Rate:	Usually normal
P waves:	Usually normal
PR Interval:	Usually normal
QRS complex:	Wide due to the activation of one ventricle before the other. The blocked ventricle spreads the impulse cell to cell and is slower.
Conduction:	Delay of excitation to one ventricle
Rhythm:	Usually regular
Causes:	CAD/MI, scarring of conduction system, trauma, cardiomyopathy, severe aortic stenosis.
Right:	V_1: rSR' V_6: qRS
Left:	V_1: rS or QS V_6, AVL, I: slurred notched R wave
Treatment	If symptomatic, pacemaker

Bundle branch block.

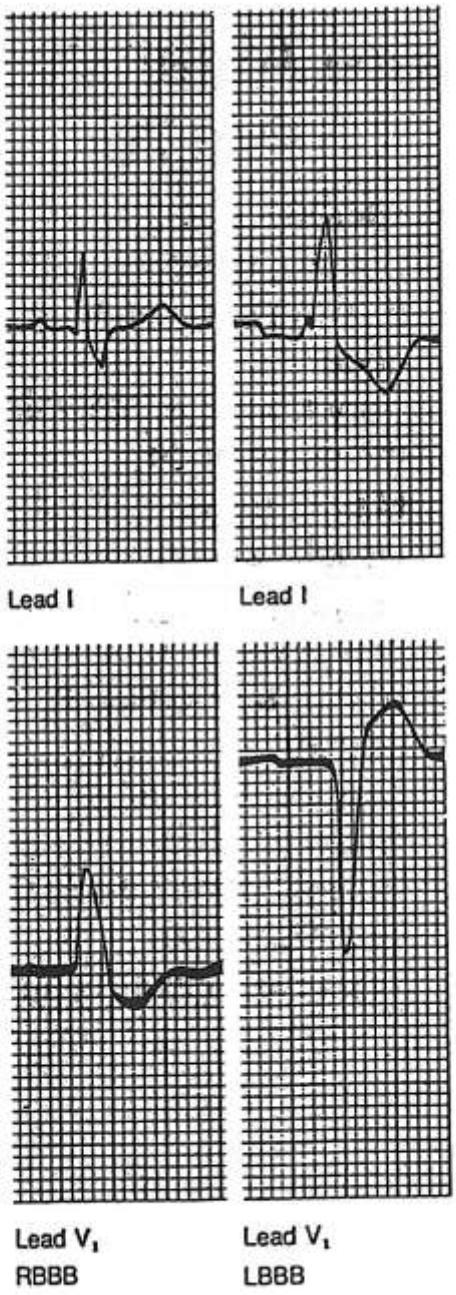
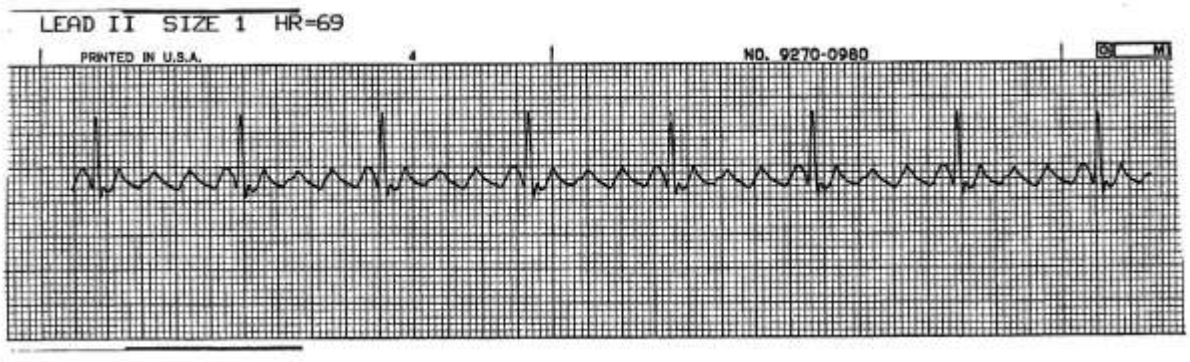


FIGURE 8-34
Bundle branch block.

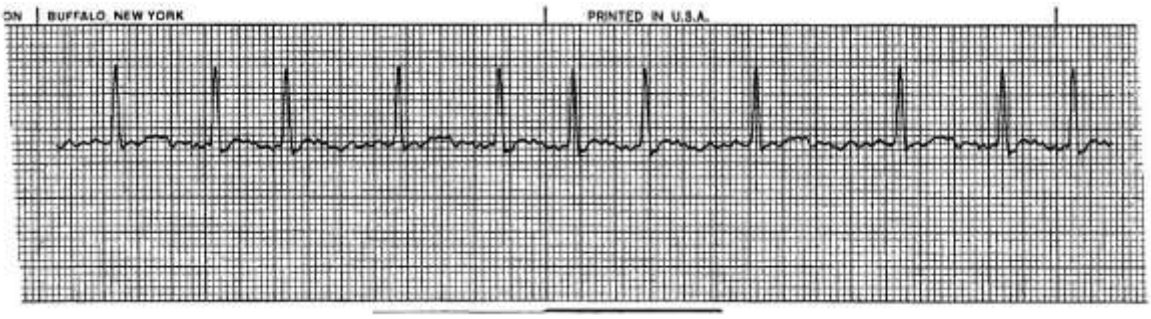
Atrial Flutter

Rate:	Atrial rate 250-350, ventricular rate is 2:1 to 4:1.
P waves:	Saw tooth, picket fence patterns.
PR Interval:	Unable to measure.
QRS Complex:	Usually normal.
Conduction:	Normal through ventricles, impulses blocked through AV node.
Rhythm:	Regular or irregular.
Causes:	Heart disease, acute cor pulmonale, heart failure, MI.
Treatment:	Treat underlying cause. Synchronized cardioversion, beta blockers, calcium channel blockers. Consider expert consultation.



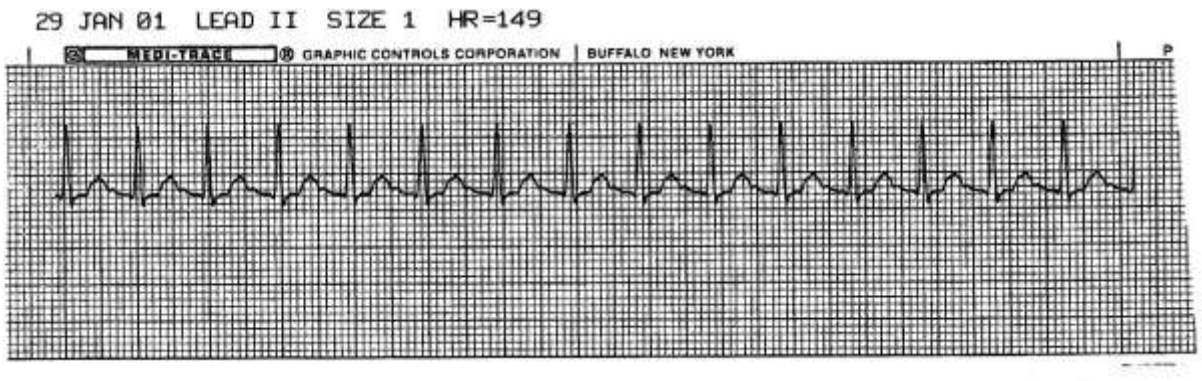
Atrial Fibrillation

Rate:	Atrial rate 350-600, ventricular rate 120-200
P waves:	Difficult to detect
PR Interval:	Unable to measure
QRS Complex:	Usually normal
Conduction:	Normal through the ventricles. Circular reentry of impulses in the atria.
Rhythm:	Irregular
Causes:	Heart failure, heart disease, acute cor pulmonale.
Treatment:	Need to treat because rapid ventricular response leads to decrease ventricular filling time. Loss of atrial kick (25-30%) of cardiac output. Synchronized cardioversion, vagal maneuvers, treat underlying cause. beta blockers, calcium channel blockers. Consider expert consultation.



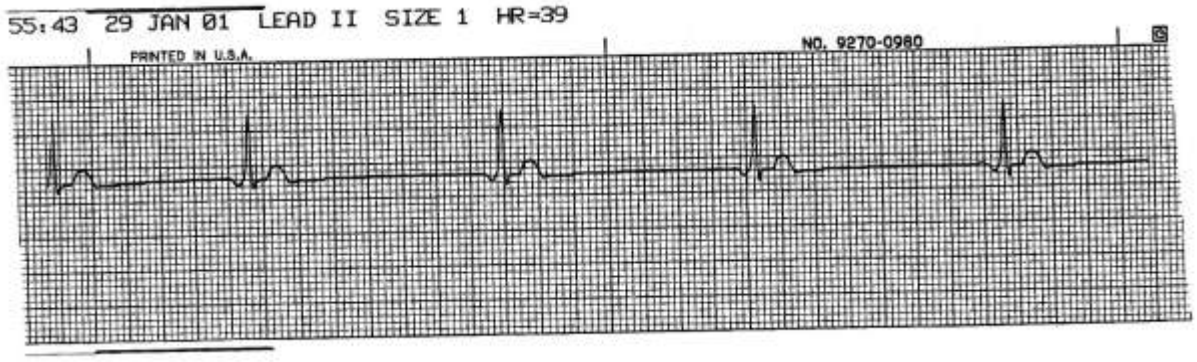
Supraventricular Tachycardia

Rate:	150-250
P waves:	Variable
PR Interval:	Variable
QRS Complex:	Usually normal
Conduction:	Normal from AV node to ventricles. Rhythm originates from above the bundle of His.
Rhythm:	Regular or Irregular
Causes:	Digitalis toxicity, pulmonary disease, emotions, tobacco, caffeine, alcohol
Treatment:	Vagal maneuvers, synchronized cardioversion, beta blockers, calcium channel blockers. If regular, consider adenosine Consider expert consultation



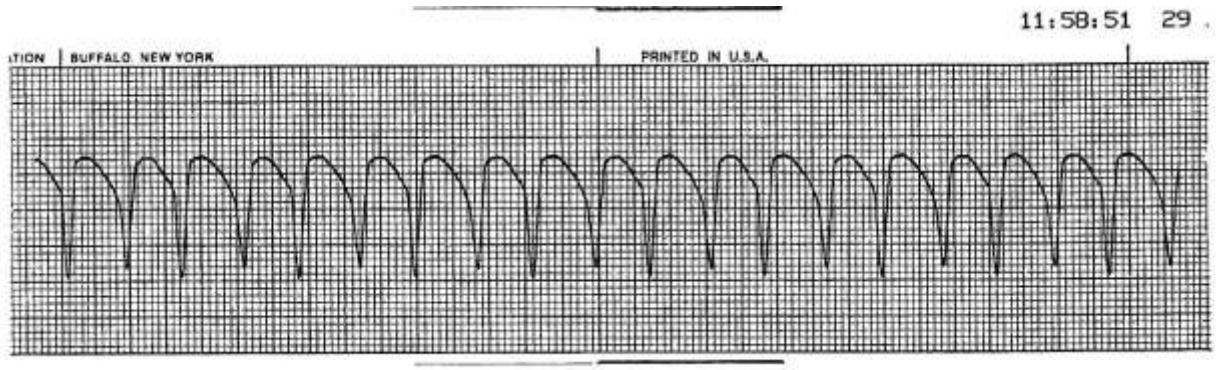
Junctional Escape

Rate:	40-60
P waves:	May be inverted and occur before, during, or after the QRS.
PR Interval:	If P wave occurs before the QRS, the interval is shortened.
QRS Complex:	Usually normal
Conduction:	Occurs when SA node fails to fire and junctional fibers take over as the pacemaker.
Rhythm:	Regular
Causes:	Digitalis toxicity, inferior MI, ischemic SA node.
Treatment:	If symptomatic, pacing. Treat underlying cause. Consider expert consultation.



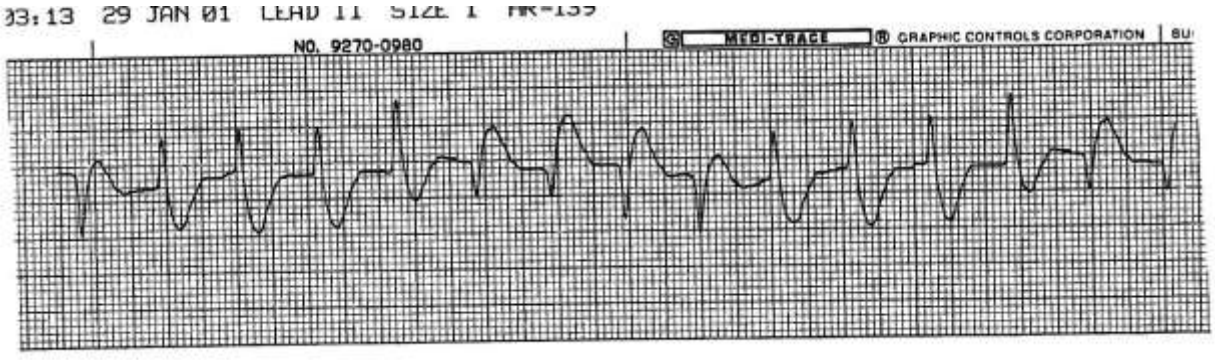
Ventricular Tachycardia

Rate:	100-200
P waves:	Usually buried in the QRS
PR Interval:	Non-existent
QRS Complex:	Wide, bizarre, T wave in opposite direction.
Conduction:	Originates in the ventricle, with possible retrograde conduction to the junction and atria.
Rhythm:	Regular or irregular
Causes:	Heart disease, myocardial irritability
Treatment:	Defibrillation, CPR if no pulse, amiodarone, epinephrine, vasopressin, treat reversible causes. If pulse consider antiarrhythmic drugs and/or infusion and expert consultation



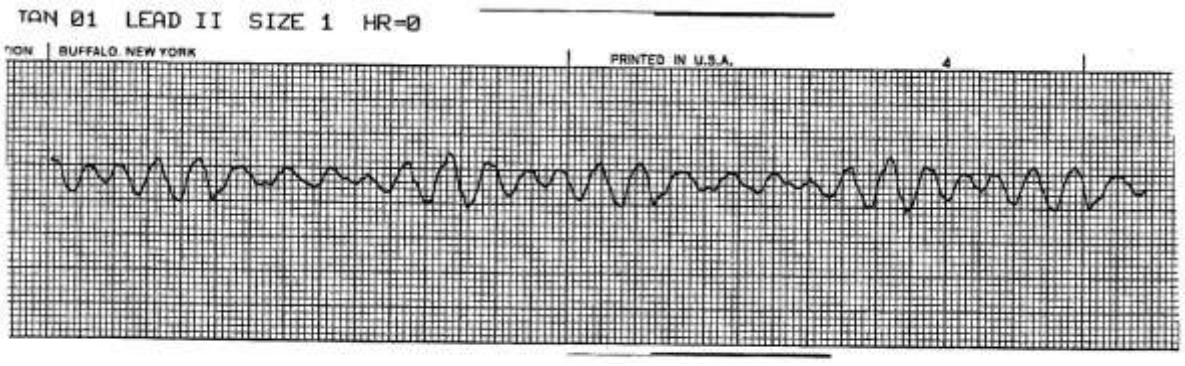
Torsades de Pointe

Rate:	100-200
P waves:	Usually buried in the QRS
PR Interval:	Non-existent
QRS Complex:	Wide, bizarre, T wave in opposite direction, twisting of the points.
Conduction:	Originates in the ventricle, with possible retrograde conduction to the junction and atria.
Rhythm:	Regular or irregular
Causes:	Uneven delay in ventricular repolarization, prolonged QT, drugs, electrolyte imbalances.
Treatment:	Defibrillation, drugs that shorted the refractory period, CPR, Magnesium Sulfate. Treat reversible causes.



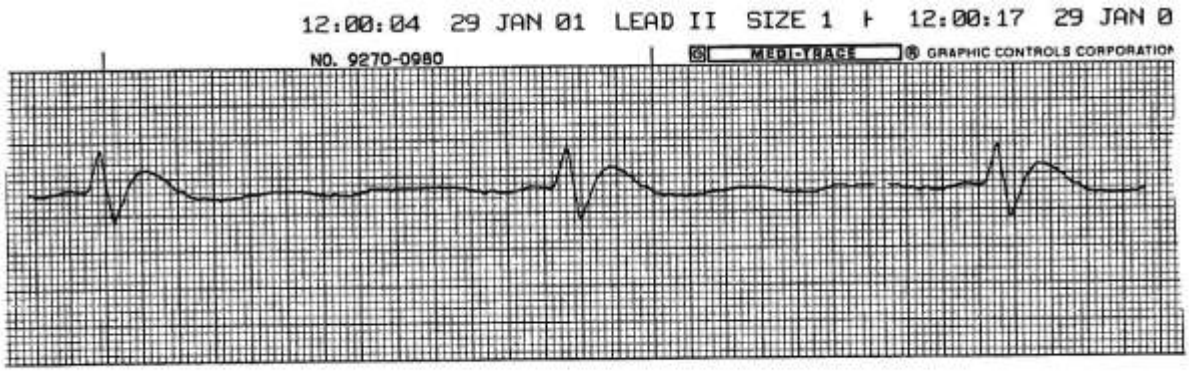
Ventricular Fibrillation

Rate:	Rapid
P waves:	None
PR Interval:	None
QRS Complex:	Coarse, quivering pattern
Conduction:	Originates in the ventricle from multiple foci, with no organized conduction
Rhythm:	Irregular
Causes:	Heart disease, myocardial irritability
Treatment:	Defibrillation, CPR, amiodarone, epinephrine, vasopressin, treat reversible causes



Ventricular Escape

Rate:	20-40
P waves:	None
PR Interval:	Non existent
QRS Complex:	Wide, bizarre, T wave in opposite direction
Conduction:	Ventricles take over as primary pacemaker
Rhythm:	Regular or irregular
Causes:	Heart disease, bundle branch blocks
Treatment:	CPR, Epinephrine, Vasopressin Treat underlying cause



Asystole

Rate:	None
P waves:	None
PR Interval:	None
QRS Complex:	None
Conduction:	None
Rhythm:	None
Causes:	Cessation of mechanical and electrical activity of the heart.
Treatment:	CPR, Epinephrine, Vasopressin Treat underlying cause