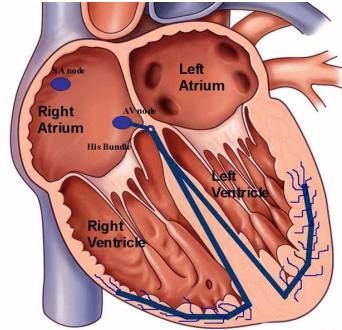


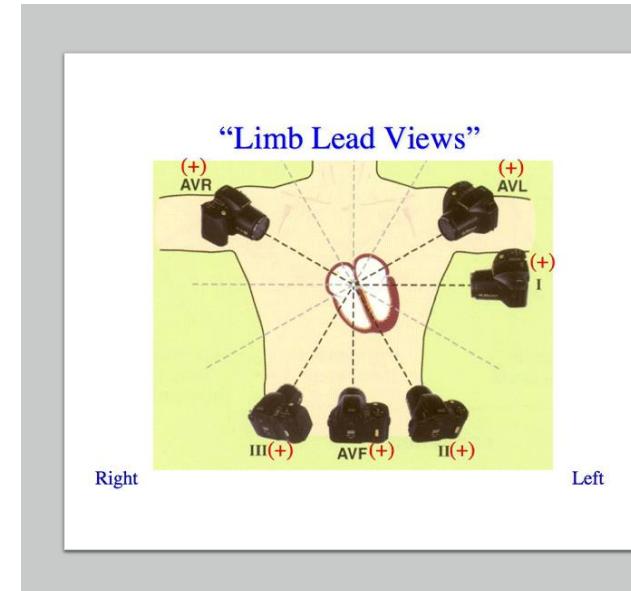
Cardiac Conduction System

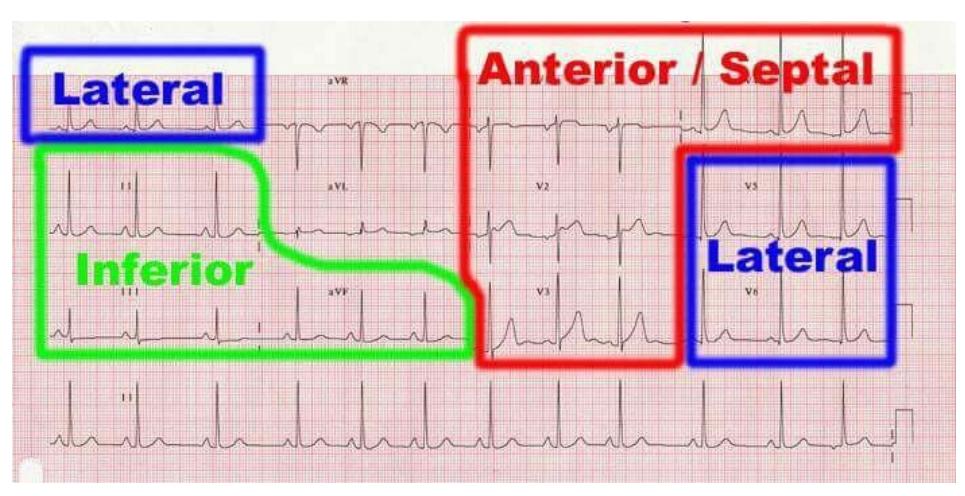
- Electrocardiogram (ECG) tracing
- SA node to AV node-contract atriums
 - Atrial systole (atrium contracting)
- Bundle of His to Purkinje Fibers-contracts ventricles
 - Ventricular systole (ventricle contracting)
- Depolarization-Electrical activity that causes heart to contract
 - Atrial depolarization
 - Ventricle depolarization
- Repolarization-heart resting state
 - Atrial repolarization
 - Ventricle repolarization



Electrocardiogram

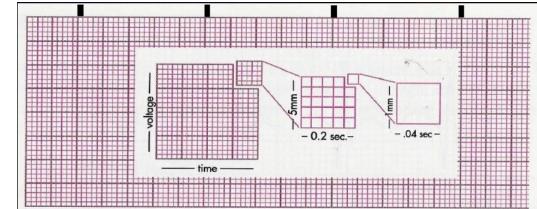
- Shows electrical activity of heart
- Electrodes are placed on skin
- Allow various views of heart's electrical activity
- Each view referred as "lead"**
- 12-lead ECG shows 12 different views of the heart
 - There are 10 leads, but gives a total of 12 views





ECG Graph Paper

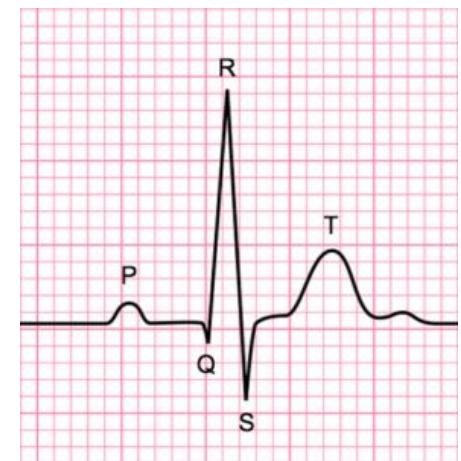
- One (1) Large block-has 5 small squares
 - One (1) large block- Represents 0.20 seconds
- Each Small squares- Represents 0.04 seconds
- Half of a Small square- Represents 0.02 seconds



Isoelectric Line-Baseline

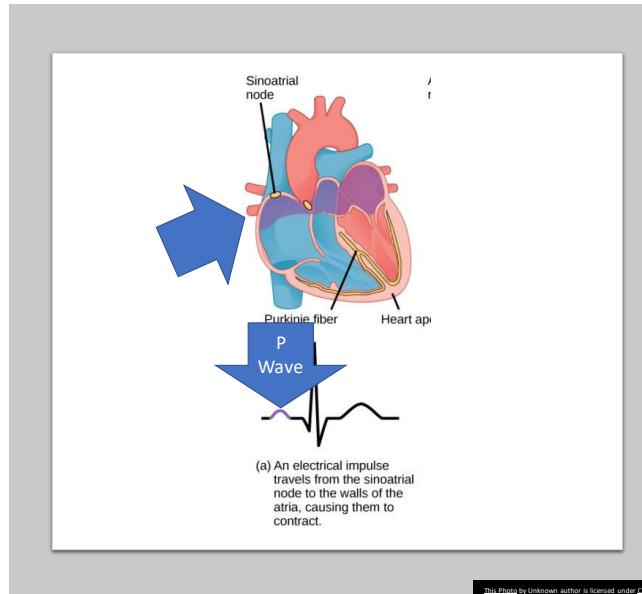


Components
of the Cardiac
Cycle



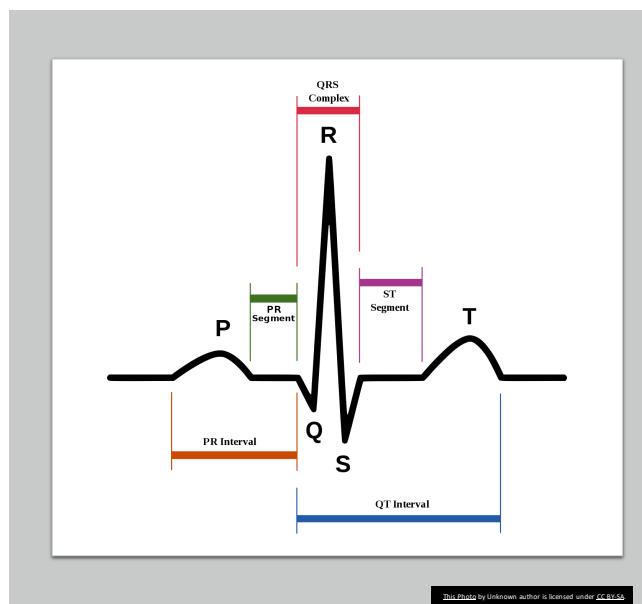
P Wave

- Represents Atrial Depolarization (Atriums contracting)
- Begins when SA node fires electrical impulse
- Spreads through atrium and contracts atrium
- Appears rounded, small hill on ECG paper
- Disorders will alter shape and size



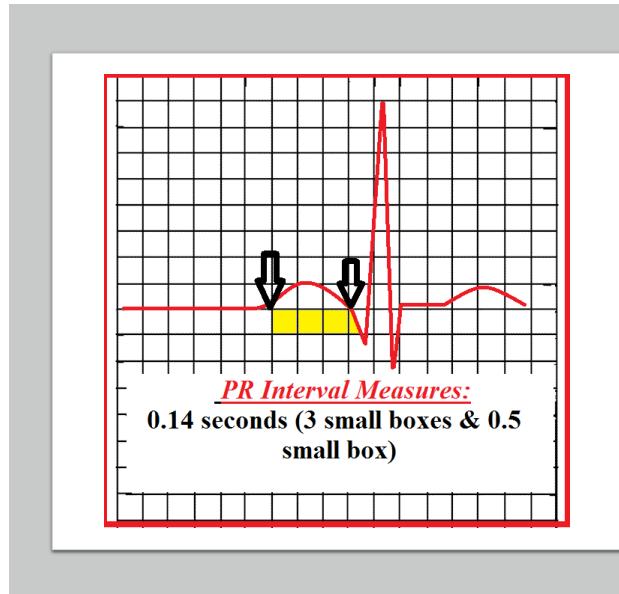
QRS Complex

- Ventricles Depolarization (Ventricle contracting)
- Time takes AV node to Purkinje Fibers
- Normal: 0.06 to 0.10 seconds
- Complex is Larger than P Wave
 - Ventricle are larger-muscle mass



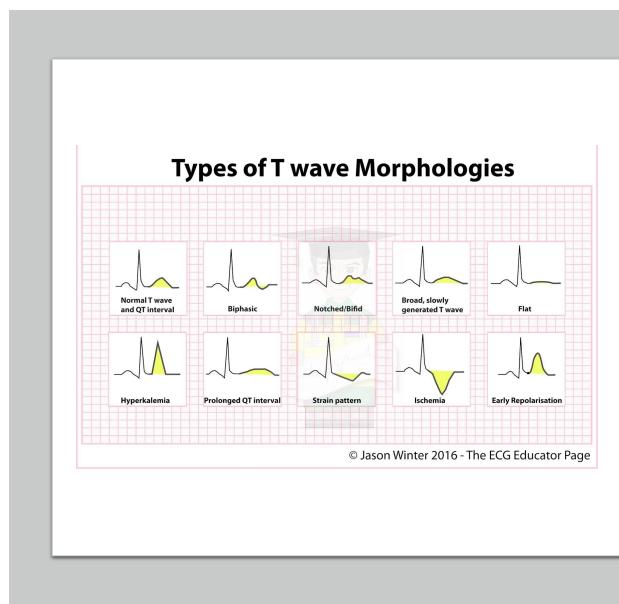
PR Interval

- Time it take from SA to AV nodes
- Normal: 0.12 to 0.20 seconds



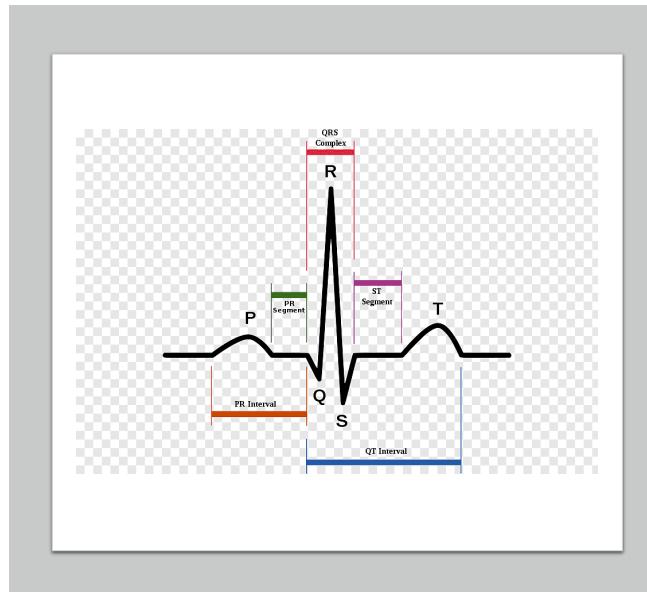
T Wave

- Ventricular Repolarization-Resting state of ventricles
- Rounded wave
- Usually "positive" (above isoelectric line)
- Inverted (below isoelectric line)-can indicate cardiac ischemia



QT Interval

- Time from start of Q wave to end of T wave
- Represents time for ventricles depolarization and repolarization
 - (Ventricle's contract and rest)
- Normal 0.34-0.43 seconds
- Varies based on gender, heart rate, age
- Prolonged or shortened-can lead to ventricular arrhythmias
- Abnormal intervals
 - Genetic, heart conditions, electrolyte imbalances, medication



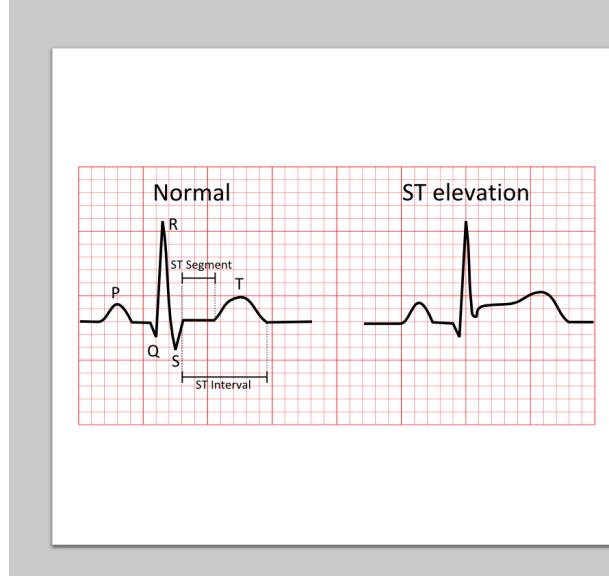
U Wave

- Usually not seen
- When is seen-generally hypokalemia (low potassium)



ST Segment

- Time from completion of depolarization (contraction) to repolarization (recovery)
- ST segments reviewed with chest pain
- Transmural Ischemia(MI with full thickness of myocardium)-ST segment can be inverted or depressed

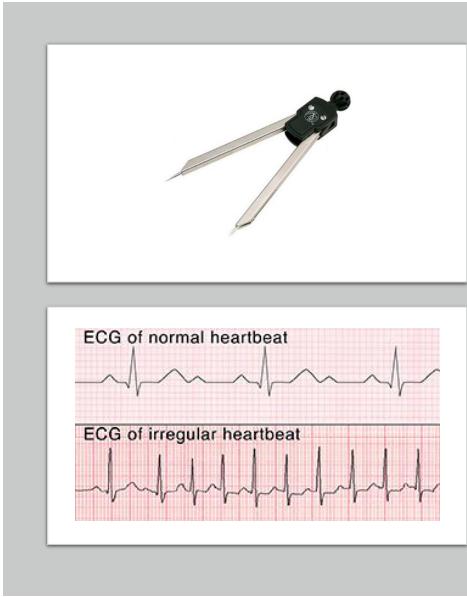


Six Step Process for Arrhythmia Interpretation

- 1 Step 1: Regularity of Rhythm
- 2 Step 2: Heart Rate
- 3 Step 3: P Waves
- 4 Step 4: PR Interval
- 5 Step 5: QRS Interval
- 6 Step 6: QT Interval

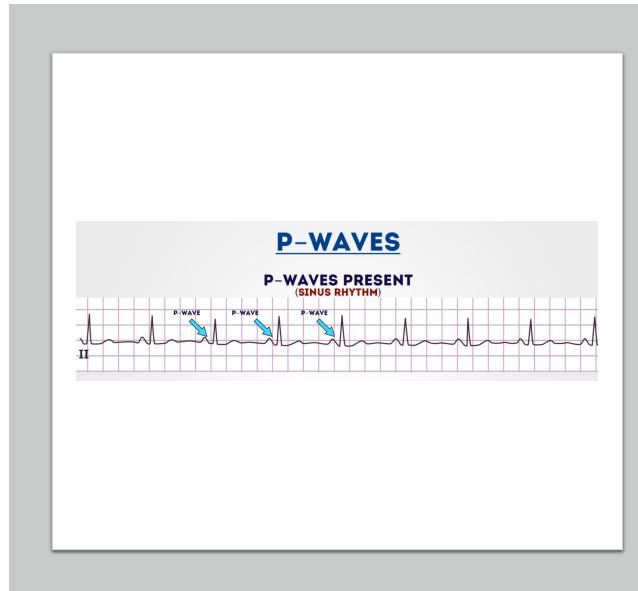
Six Step Process for Arrhythmia Interpretation

- Step 1: Regularity of Rhythm
- Look at "R" to "R" spacing-should be no greater than 2 small squares
- Calipers



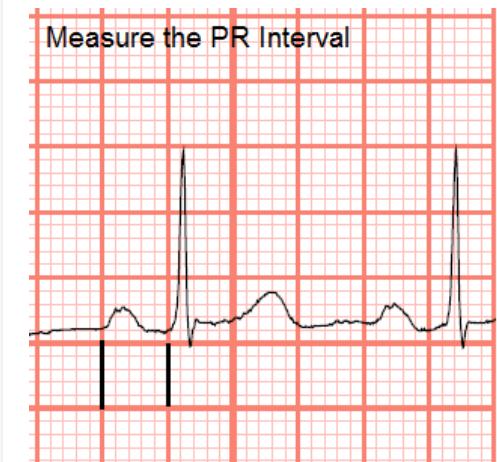
Step 3: P waves

- Are there P waves before each QRS?
- Are P waves regular?
- Do P waves all look alike?
- If so... P waves are normal



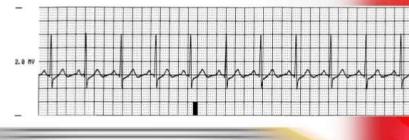
Step 4: PR Interval

- Distance between start of P wave to start of "R"
- Normal: 0.12-0.20 seconds



1500 Method

- ▼ Most precise way to determine rate
- ▼ Can only be used if rhythm is regular
- ▼ Count number of small squares between two QRS complexes (R wave to R wave)
- ▼ Divide the number of small squares into 1500



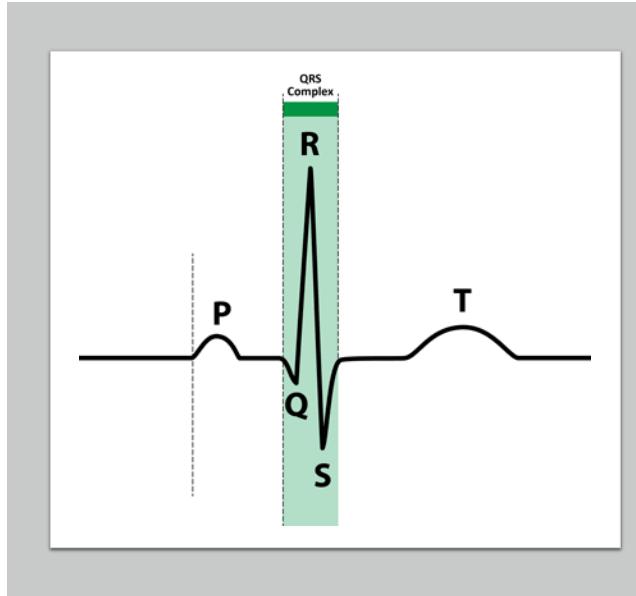
Six second method

- On six second strip, count the number of R waves and multiply that number by 10
- For example, if the number of R waves on a three second strip is 8, the rate is $8 \times 10 = 80$



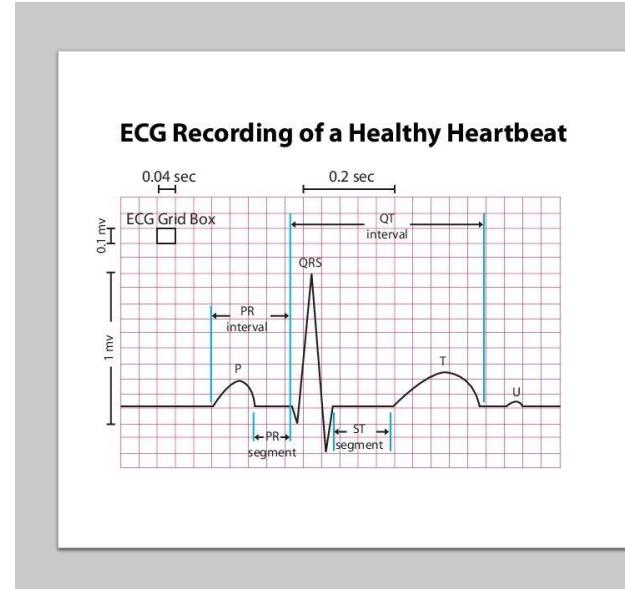
Step 5: QRS Interval

- Time from "Q" to "S"
- Normal: 0.06 to 0.10 seconds



Step 6: QT Interval

- Time from start of "Q" to Start of "T"
- Measured to determine if prolonged or shortened
- Represents time of depolarization (ventricle contraction) to repolarization (ventricle rest)



Catch the Wave



Catch the

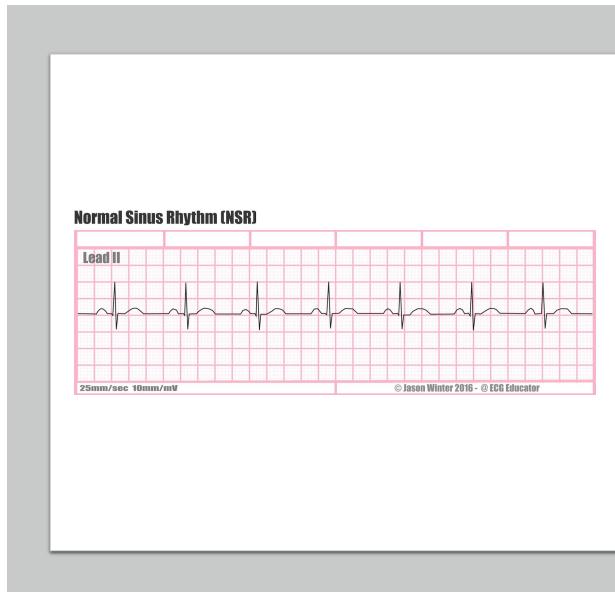


• Bundle of His



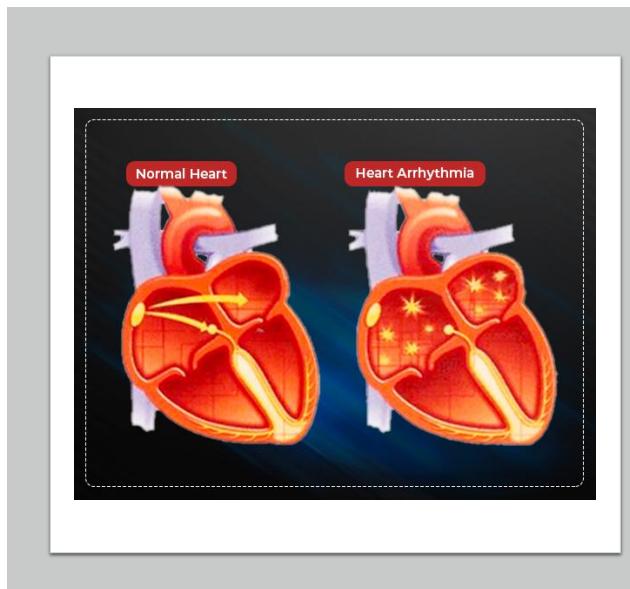
Normal Sinus Rhythm

- Originates in SA node
- Rhythm: regular
- Heart rate: 60-100 bpm
- P waves: rounded, upright, precede each QRS, alike
- PR Interval: 0.12 to 0.20 seconds
- QRS Interval: less or equal to 0.10 seconds



Arrhythmias

- Abnormal rhythm of heart
- Causes: Abnormal starting (formation/conduction) of electrical impulse
- Can Cause:
 - Increase or decrease in heartrate
 - Early or late heartbeats
 - Atrial or ventricle fibrillation
 - Impulse being blocked



Sinus Bradycardia

- Heartrate slower than 60 bpm
- Originates from SA node
- Can be symptomatic or asymptomatic
- Causes:
 - Digoxin
 - Myocardial infarction
 - Electrolyte imbalance
 - Well-conditioned athletes-heart works efficiently
- Rhythm: regular
- Heart rate: less than 60 bpm
- P Waves: rounded, upright precedes each QRS, alike
- PR Interval: 0.12 to 0.20 seconds
- QRS Interval: less than or equal to 0.10 seconds
- S/S: decreased blood pressure, respiratory distress, diminished pulses, fatigue, syncope
- Treatment: Intravenous atropine, dopamine, epinephrine





Catch the Wave-Bradycardia



Catch the Wave-Tachycardia

Sinus Tachycardia

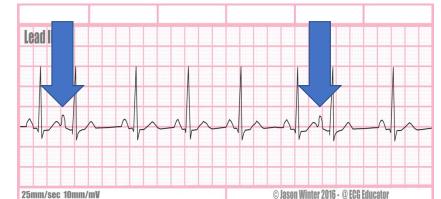
- Heart rate greater than 100 bpm
- Originates from SA Node
- Causes: physical activity, hemorrhage, shock, medications, dehydration, fever, MI, electrolyte imbalance, fear
- Rhythm: regular
- Heartrate: 101 to 180 bpm
- P Waves: rounded, upright, precede each QRS, alike
- PR Interval: 0.12 to 0.20 seconds
- QRS Interval: less than or equal to 0.10 seconds
- S/S: angina, dyspnea, syncope, tachypnea
- Treatment: Treat cause; medications-adenosine, beta blockers, calcium blockers (slows heartrate)



Premature Atrial Contractions (PACs)

- Premature- "Early"
- Atria fires impulse BEFORE SA node
- Causes: hypoxia, smoking, stress, myocardial ischemia, enlarged atria in valve disorders, Digoxin, electrolyte imbalance, heart failure
- Rhythm: PAC interrupts underlying rhythm
- Heartrate: depends on underlying rhythm
- P waves: early beat abnormal shaped
- PR interval: With PAC-shortened or prolonged
- QRS Interval: less than or equal to 0.10 seconds
- S/S: None to palpitations
- Treatment: Not usually serious; Frequent PACs-atrial irritability...can worsen...beta blockers to slow heartrate

Premature Atrial Contraction (PAC)





Catch the Wave-Premature Atrial Contraction (PAC)



Catch the Wave-Atrial Flutter



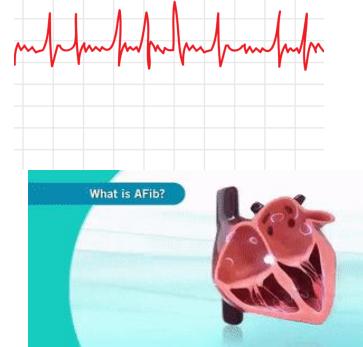
Atrial Flutter

- Atria contracts (Flutters) rate 250-350 bpm
- Also known as "F" waves, appears like sawtooth pattern
- Some impulses are captured by AV node to Bundle of His...Purkinje Fibers
- Result is normal QRS (normal ventricle contractions)
- 2-4 Flutter waves between QRS
- Causes: rheumatic fever, ischemia, congestive heart failure, hypertension, pericarditis, pulmonary embolism, post-CABG, medications
- Rhythm: Regular
- Heartrate: varies for ventricle bpm; 250-350 for atrial bpm
- P Waves: Flutter
- PR Interval: none measurable
- QRS Interval: less than or equal to 0.10 second
- S/S: Depends on ventricle rate; if rapid-palpitations, angina or dyspnea
- Treatment: Unstable-cardioversion (electrical shock); calcium channel blockers, ablation in atria



Atrial Fibrillation

- Atria is fibrillating (quivering)
- Not effective in pumping blood out of atriums
 - Risk for blood clots
 - Stroke
 - Medications to decrease risk
- Atrial rate 350-600 bpm
- Only few impulses get to AV node-irregular rhythm
- Causes: age, cardiac surgery, heart failure, hypertension, heart valve replacement, MI, hyperthyroidism, emphysema, sleep apnea, medications
- Rhythm: irregular
- Heart rate: Atrial-350-600 bpm; ventricles under 100 bpm (controlled) over 100 bpm (uncontrolled)
- P waves: not identifiable
- PR Interval: none
- QRS Interval: less than or equal to 0.10 seconds
- S/S: irregular rhythm-feel it; palpitations, short of breath, dizzy, chest discomfort
- Treatment: Prevent thromboembolism; unstable-synchronized cardioversion; stable-medications to control ventricular rate; anticoagulants
- Catheter Ablation



What is AFib?





Catch the Wave-Atrial Fibrillation



Catch the Wave-Third Degree Heart Block



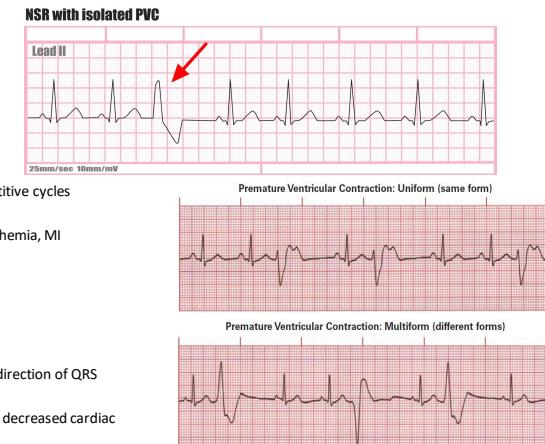
Third-Degree Atrioventricular Block

- SA Nodes are blocked to ventricles-but still are produced
- AV Node or Bundle of His or Purkinje Fibers must create impulse-or heart stops
- Also known as "Complete Heart Block"
- Atriums and ventricles are working independent of each other
- QRS will be either narrow (AV node) wide (Bundle of His or Purkinje Fibers)-depends on which is sending impulse to ventricles
- Rhythm: P to P regular; R to R regular; but not working together
- Heartrate: atrial 60-100 bpm; ventricular rates slower-40-60 bpm (remember if ventricles must start impulse...it is slower)
- P waves: rounded, upright, alike
- PR interval: No actual interval; not working correctly
- QRS Interval: less than or equal to 0.10 (AV node) greater than 0.10 (Ventricular)
- Causes: MI, hyperkalemia, infection, medication, digoxin
- Treatment: Medical emergency! Oxygen, transcutaneous pacing immediately, atropine, permanent pacemaker



Premature Ventricular Contractions (PVCs)

- Originates in ventricles
- Irritable ventricles fires prematurely before the SA Node
- Creating a wide (greater than 0.10 seconds) "bizarre" QRS
- Shapes: Unifocal (all look same), Multifocal (all look different), Repetitive cycles (Bigeminy, Trigeminy, Quadrigeminy)
- Causes: caffeine, alcohol, anxiety, hypokalemia, cardiomyopathy, ischemia, MI
- Rhythm: PVC interrupts rhythm
- Heartrate: depends on underlying rate
- P waves: absent before PVC
- PR Interval: none for PVC
- QRS Interval: if PVC is greater than 0.10 seconds T wave is opposite direction of QRS (QRS upright; T downward or QRS downward; T upright)
- S/S: Described as skipped beat, palpitation, with frequent-dizziness, decreased cardiac output
- Treatment: Occasional PVC-no treatment; more than 6 per minute, falling on the T wave (R-on-T wave phenomenon)-life threatening; antiarrhythmic drugs





Catch the Wave-Premature Ventricular Beat



Catch the Wave-Ventricular Tachycardia

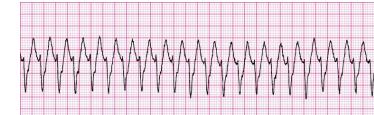
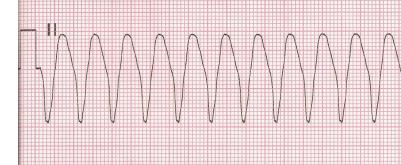


Ventricular Tachycardia

- 3 or more PVCs
- Continuous firing of ectopic ventricular impulse
- The ventricles instead of SA node become pacemaker
- Produces wide (greater than 0.10 seconds) bizarre QRS
- Causes: myocardial irritability, MI, cardiomyopathy, respiratory acidosis, hypokalemia, digoxin, cardiac cath, pacing wires
- Rhythm: regular
- Heartrate: 150-250 ventricular bpm; slow VTach-below 150 bpm
- P waves: absent
- PR Interval: none
- QRS Interval: greater than 0.10 seconds
- S/S: dyspnea, awareness of increased heartrate, palpitations, dizziness, angina, sustained VTach-compromises cardiac output and can become pulseless VTach
- Treatment: stable-antidysrhythmic medications; pulseless and not breathing-CPR and defibrillation

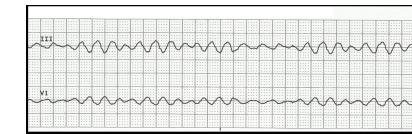


ID#: 102111174043 210ct11 17:52:18 HR: 182

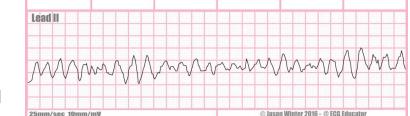


Ventricular Fibrillation

- Many ectopic ventricular impulses fire at same time
- Ventricles are chaotic, ventricles quiver
- Loss of cardiac output
- If not corrected immediately-death will occur
- Causes: hyperkalemia, hypomagnesemia, electrocution, coronary artery disease, MI
- Rhythm: chaotic, irregular
- Heartrate: not measurable
- P Waves: none
- PR Interval: None
- QRS Interval: none
- S/S: Loss of consciousness, no heart sounds, pulses, blood pressure readings, respiratory arrest, cyanosis, pupil dilation
- Treatment: immediate defibrillation and CPR, Endotracheal intubation with oxygen



Ventricular Fibrillation (VF)



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Catch the Wave-Ventricular Fibrillation



Catch the Wave-Astystole



Asystole

- Absence of electrical activity of heart
- Causes: hyperkalemia, VF, MI
- Rhythm: None
- Heart rate: None
- P wave: None
- PR Interval: None
- QRS Interval: None
- S/S: unconscious and unresponsive; no heart sounds, pulses, blood pressure
- Treatment: CPR, endotracheal intubation for oxygen, epinephrine



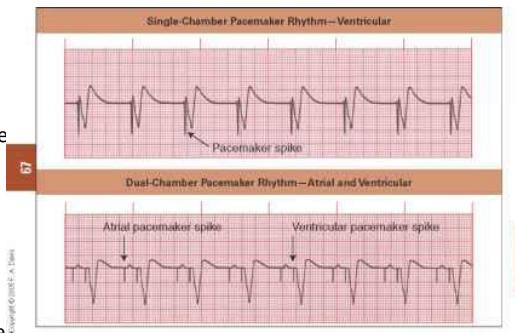
Cardiac Pacemakers

- Used to generate electrical impulse when heart's conduction system has a problem in performing it
- Can be temporary or permanent
- Temporary: bradycardia or tachycardia, after MI (allows heart time to heal)
- Permanent: inserted subcutaneously, attached to leads inserted into heart; lead delivers impulse directly to heart wall
- Can be single to right or left atrium
- Can be dual chamber-one lead to right atrium and other to right ventricle
- Leadless pacemakers-implanted in right ventricle without leads; size of vitamin capsule



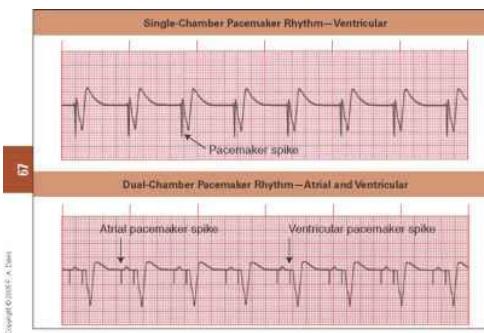
Cardiac Pacemakers

- Small spike is seen on ECG at the start of the pace beat
- Can precede P wave or QRS complex
- Problems with pacemakers:
- Failure to sense a patient's own beat
- Failure to pace because of malfunction
- Failure to capture-not causing heart to depolarize (contracting)

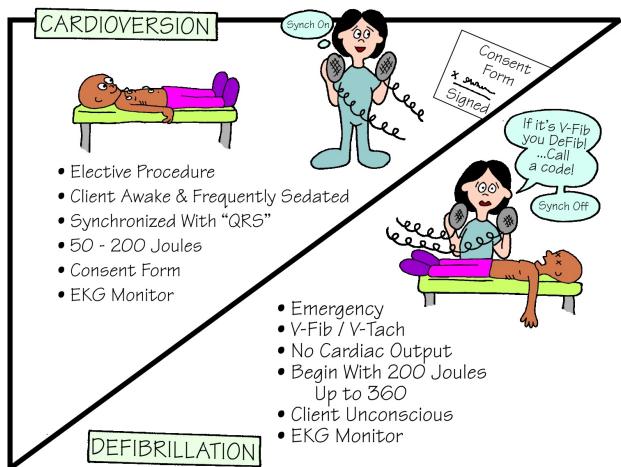


Cardiac Pacemakers

- Nursing Care:
 - Rhythm, apical pulse, and incision are monitored
 - Chest pain or change in V/S are immediately reported
 - Discharge teaching:
 - Care for incision
 - Ordered activity restrictions (limit raising arm on pacemaker side, driving, returning to work)
 - Caution with security metal detectors, antitheft systems, MP3 headphones, MRI, Welders above 130 amps, radio towers, touching running car engines
 - Carry pacemaker identification card
 - Report chest pain, dizziness, fainting, irregular beats, palpitations, muscle twitching
 - Keep follow up appointments



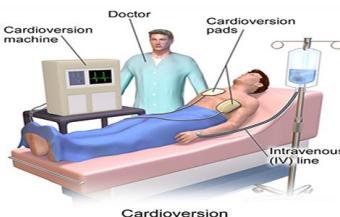
Defibrillation versus Cardioversion



Defibrillation versus Cardioversion

Defibrillation

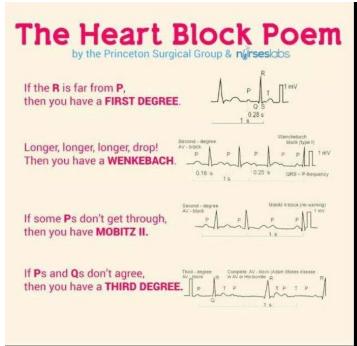
- Used for **pulseless VTach or Vfib**
- Delivers electrical shock to reset heart's rhythm



Cardioversion

- Defibrillator set in synchronized mode
- **Picks up R wave** and shock is given
- Used for Vtach with pulse, arrhythmias not responsive to medications
- Patient given sedative during procedure

The Heart Block Poem



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Who am I?



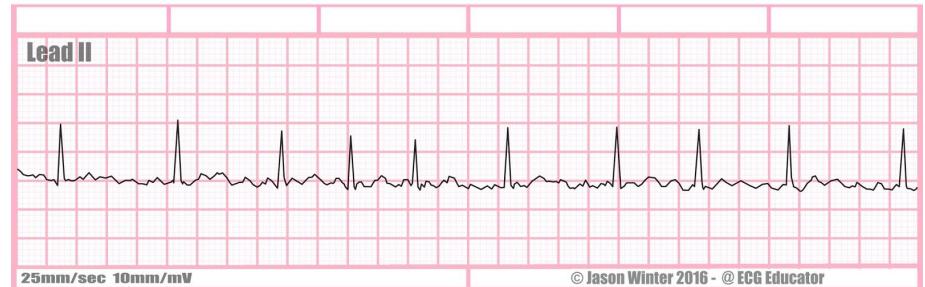
Who am I? [Redacted]



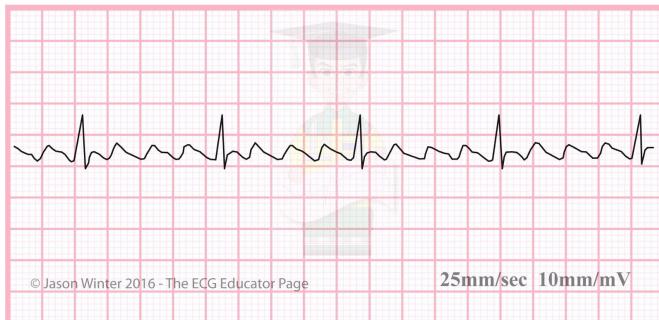
Who am I?



Who am I?



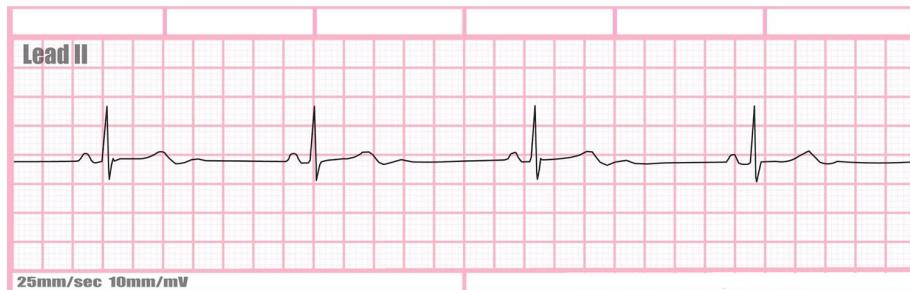
Who am I?



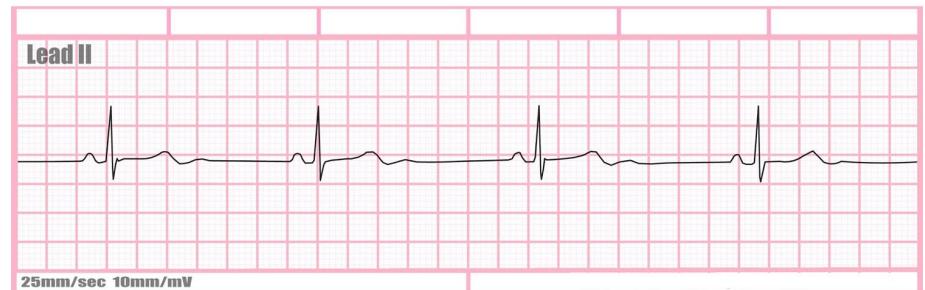
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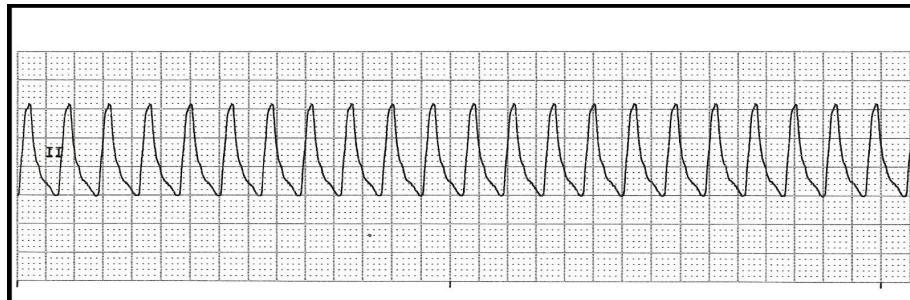
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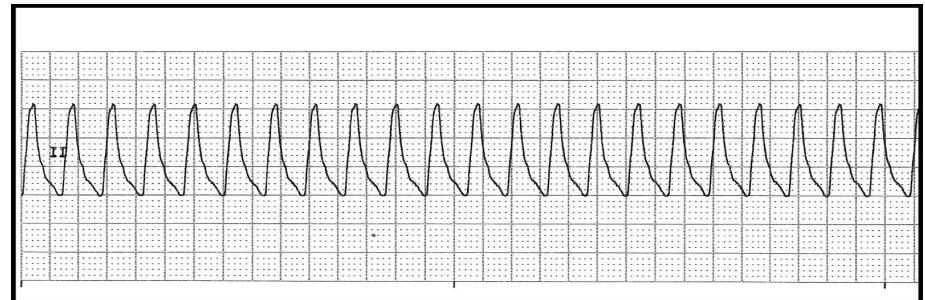
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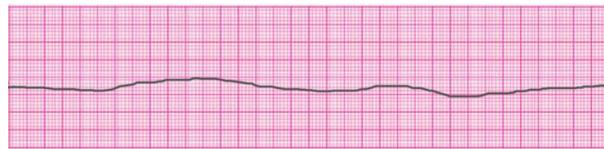
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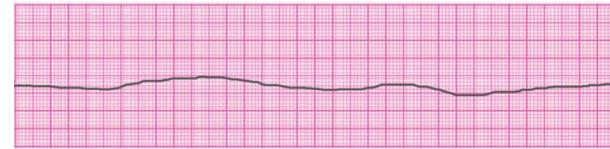
Who am I?



Who am I?



Who am I?



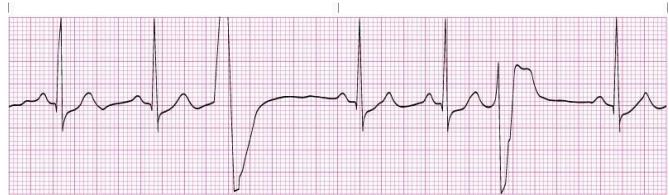
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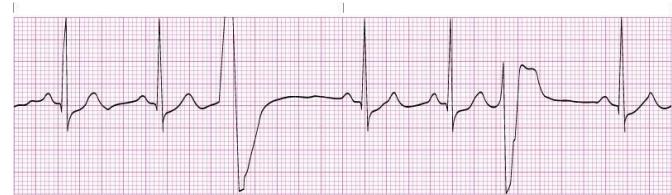
Who am I?



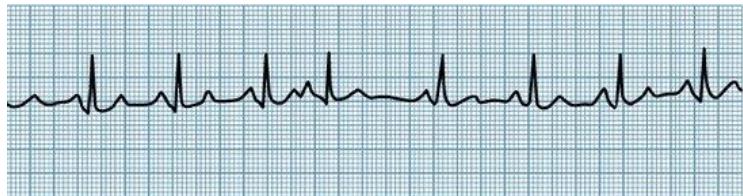
Who am I?



Who am I?



Who am I?



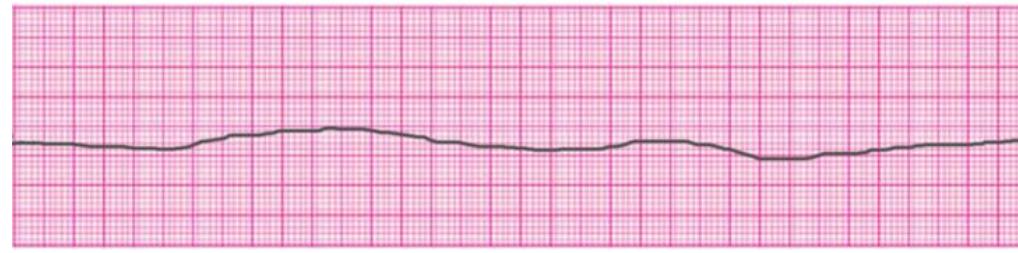
Who am I?



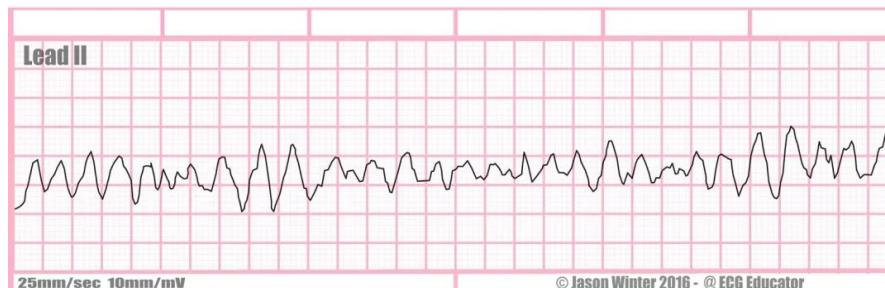
What is normal

- Rhythm:
- Heartrate:
- P Waves:
- PR Interval:
- QRS Interval:

What to do?



What to do?



What is the difference between defibrillation and cardioversion?

- Defibrillation:



- Cardioversion:

