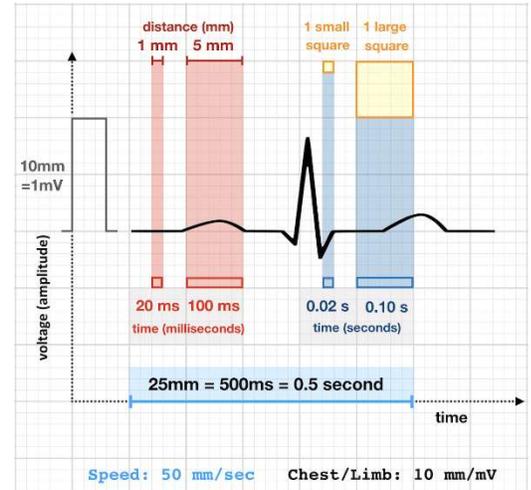
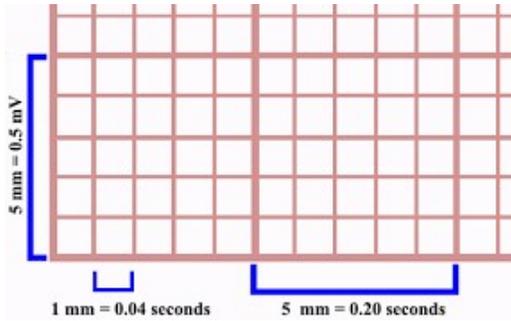




Telemetry – Systemic Approach to Analyzing EKG Rhythms

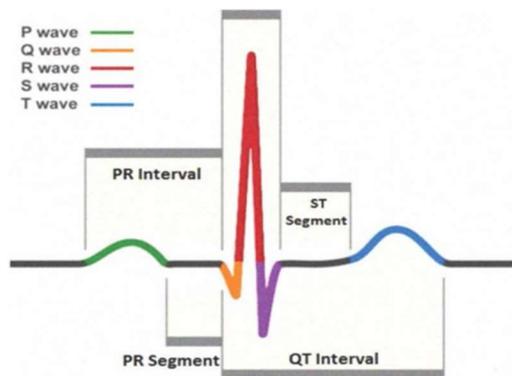
Graph Paper:

- We use time (seconds) and amplitude to measure
- Each small box represents 0.04 seconds and each large box (comprised of five small boxes) represent 0.20 seconds



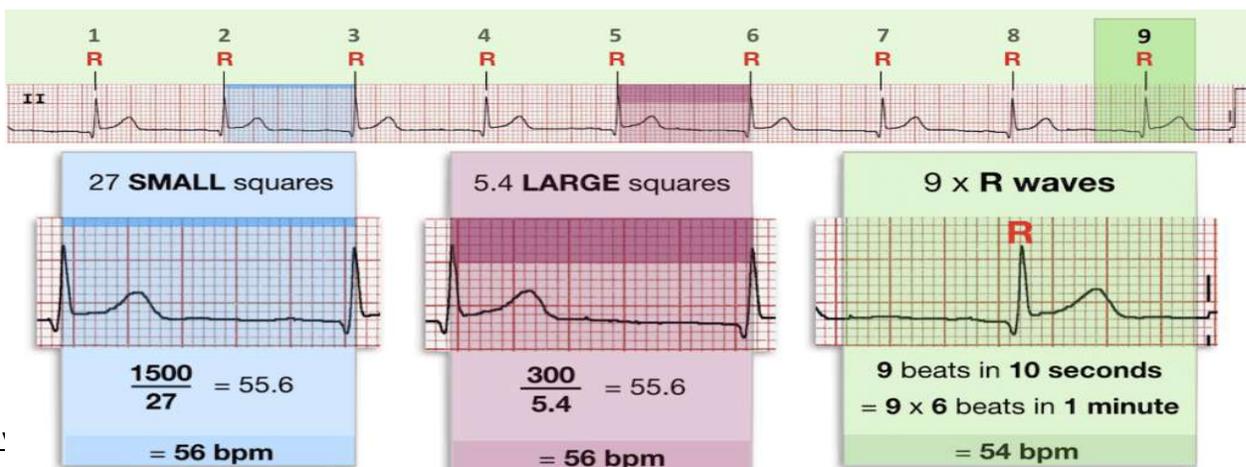
5 Steps to Identifying Rhythms:

1. Rate
2. Rhythm
3. P-Wave
4. PR Interval
5. QRS



Rate:

- *Grid method:* # of large boxes between 2 R's and divide by 300
- *Ruler method:* # of small boxes between 2 R's and divide by 1500
- *6 second strip method:* Using a 6 second strip, count number of R's and multiply by 10



Rh:

Speed: 25 mm/sec



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- Is the rhythm regular?
 - o When you measure from R to R, is it constant/the same?
- The rhythm is either regular or irregular
 - o Regular: arranged in or constituting a constant or definite pattern
 - o Irregular: not even or balanced in shape or arrangement

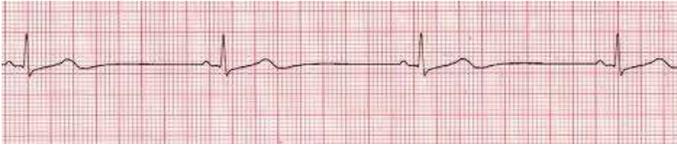
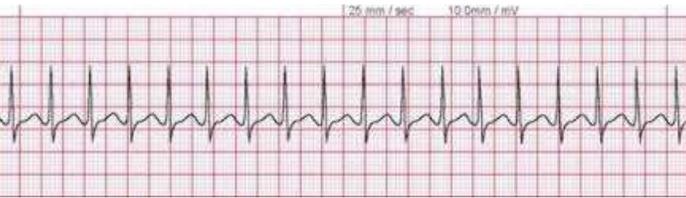
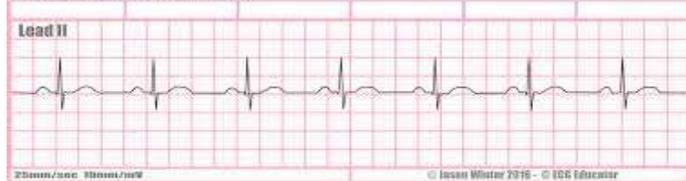


Figure 2. Atrial fibrillation on an electrocardiogram



Normal Sinus Rhythm (NSR)

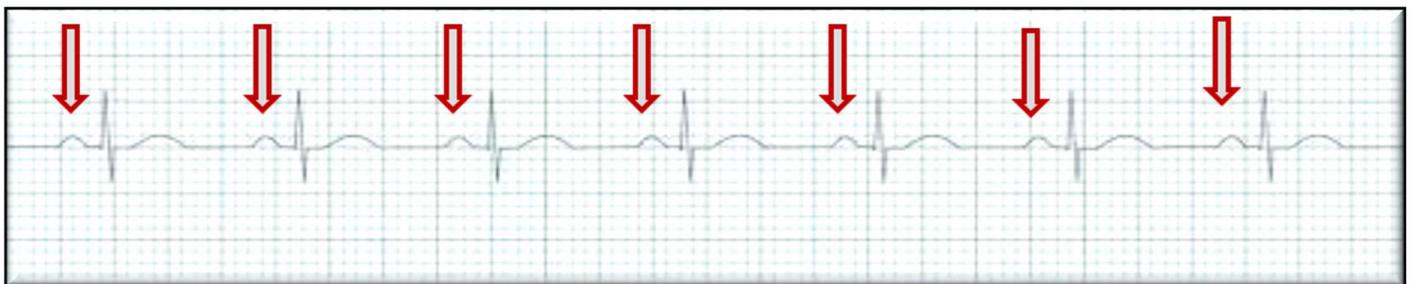


REGULAR

IRREGULAR

P-Wave:

- Is there a p-wave before every QRS?
- Are they all the same shape?
- Are they all upright? (Lead II)
- Are there any extra p-waves?

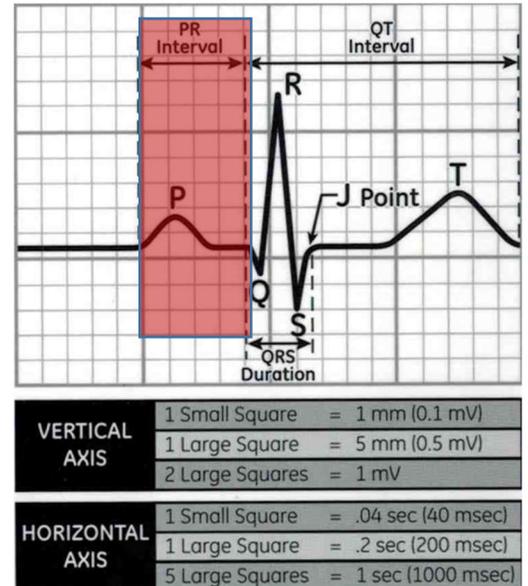




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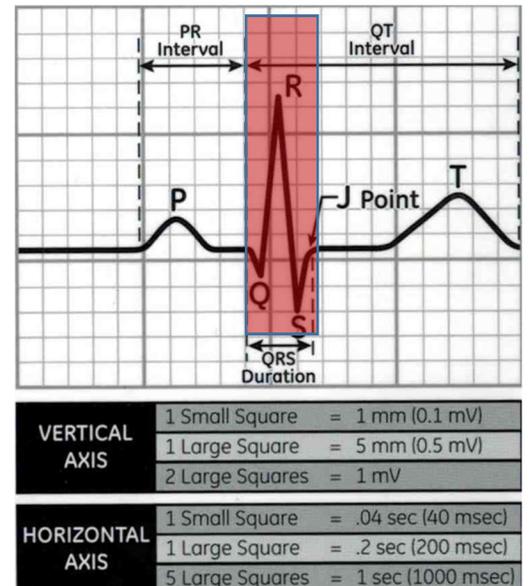
PR Interval:

- Measuring from the beginning of the p-wave to the beginning of the QRS
- Normal is 0.12 to 0.20 seconds
 - o If it is larger than one large box, it is abnormal
 - o A PR interval greater than 0.20 seconds is a 1st degree AV block



QRS:

- Measuring from the beginning of the Q wave to the end of the S wave
- Normal is less than 0.12 seconds





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Sinus Rhythms:

| Interpretation | Rate | Rhythm | P-wave | PR interval | QRS |
|--------------------------|-----------------|--|--|---|----------------|
| Sinus Rhythm | 60-100 | R-R regular and constant | Uniform, one for every QRS, upright, rounded | Between 0.12 and 0.20 seconds, constant | < 0.12 seconds |
| Sinus Bradycardia | < 60 | R-R regular and constant | Uniform, one for every QRS, upright, rounded | Between 0.12 and 0.20 seconds, constant | < 0.12 seconds |
| Sinus Tachycardia | 100-160 | R-R regular and constant | Uniform, one for every QRS, upright, rounded | Between 0.12 and 0.20 seconds, constant | < 0.12 seconds |
| Sinus Arrhythmia | Usually, 60-100 | R-R vary, rate changes with respirations | Uniform, one for every QRS, upright, rounded | Between 0.12 and 0.20 seconds, constant | < 0.12 seconds |

Atrial Rhythms:

| Interpretation | Rate | Rhythm | P-Wave | PR Interval | QRS |
|---|---|---|--|---|----------------|
| Wandering Atrial Pacemaker | 60-100, but can be slower | R-R intervals vary as pacemaker site changes, can be slightly irregular | Morphology changes when pacemaker site changes; should be one p-wave in front of every QRS | All should be < 0.20 seconds Some could be < 0.12 seconds | < 0.12 seconds |
| Premature Atrial Contraction (PAC) | Overall HR is calculated on underlying rhythm | Single ectopic beat that interrupts underlying rhythm | P wave of ectopic beat may look different (flattened or notched) | Should be 0.12 to 0.20 seconds, can be prolonged PR interval of ectopic beat will be different than normal PR interval | < 0.12 seconds |



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| | | | | | |
|--|--|--|--|--|--|
| Atrial Tachycardia | Atrial and Ventricular rates equal 150-250 | R-R regular and constant | P wave for every QRS, p-waves look different than a sinus rhythm p wave (flattened or notched) | 0.12 to 0.20 seconds but may be difficult to measure | < 0.12 seconds |
| Atrial Flutter | Atrial rate between 250-300 Ventricular rate varies | Atrial rhythm is regular but ventricular rhythm will depend on how many impulses conduct through the AV junction | Saw tooth appearance | Not measured | < 0.12 seconds but may be difficult to measure |
| Atrial Fibrillation | Atrial rate can't be measured Ventricular rate can vary; if <100 it's a controlled rate; if > 100 it is an uncontrolled rate or RVR | Irregular | Fibrillation waves; undulations of baseline | Not measured | < 0.12 seconds |
| Supraventricular Tachycardia (SVT/PSVT) | Fast, 150-220 | R-R regular and constant | P-wave uncertain, buried in preceding T-wave | Not measured | < 0.12 seconds |



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Junctional Rhythms:

| Interpretation | Rate | Rhythm | P-Wave | PR Interval | QRS |
|---|---|---|---|--|----------------|
| Premature Junction Contraction (PJC) | Will depend on underlying rhythm | Single ectopic beat that interrupts underlying rhythm | Can be before or after the QRS complex; can also be lost in the QRS complex | If it's before the QRS complex, it can be measured; usually < 0.12 sec | < 0.12 seconds |
| Junctional Escape Rhythm | Atrial and ventricular rates equal; 40-60 | R-R regular and constant | If visible, it will be inverted; usually not visible | If visible and preceding the QRS, it will be < 0.12 sec | < 0.12 seconds |
| Accelerated Junctional | Atrial and ventricular rates equal; 60-100 | R-R regular and constant | If visible, it will be inverted; usually not visible | If visible and preceding the QRS, it will be < 0.12 sec | < 0.12 seconds |
| Junctional Tachycardia | Atrial and ventricular rates equal; 100-180 | R-R regular and constant | If visible, it will be inverted; usually not visible | If visible and preceding the QRS, it will be < 0.12 sec | < 0.12 seconds |

Ventricular Rhythms:

| Interpretation | Rate | Rhythm | P-Wave | PR Interval | QRS |
|--|----------------------------------|---|--|--------------|-------------------------------|
| Premature Ventricular Contraction (PVC) | Will depend on underlying rhythm | Single ectopic beat that interrupts underlying rhythm | P-wave before every QRS, other than the one divergent beat | Not measured | Wide, bizarre QRS, > 0.12 sec |
| Ventricular Tachycardia | Fast, 100-220 | Essentially regular | P-waves usually buried in QRS | Not measured | Wide, distorted, > 0.12 sec |
| Ventricular Fibrillation | None | None | None | None | None |



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Heart Blocks:

| Interpretation | Rate | Rhythm | P-Wave | PR Interval | QRS |
|--|---|--|--|--|----------------|
| 1st Degree AV Block | May be normal or bradycardic | R-R regular and constant | Uniform, one for every QRS, upright, rounded | Prolonged, > 0.12 sec | < 0.12 seconds |
| 2nd degree Type 1 (Wenckebach) | Often bradycardic | P-P remains relatively constant; progressive prolongation of PR interval culminating in a non-conductive p-wave | More p-waves than QRS's; upright and rounded | Successive prolongation of PR interval until a p-wave is blocked (long, longer, longest, drop) | < 0.12 seconds |
| 2nd degree Type 2 (Mobitz II) | Often bradycardic | P-P constant, intermittent non-conductive p waves without progressive prolongation of PR interval | More p-waves than QRS's (extra p waves); occasional p wave without a QRS | Constant in conductive beats | < 0.12 seconds |
| 3rd degree AV Block (Complete Heart Block) | Typically profound bradycardia; atrial rate usually normal; ventricular rate slow | Both P-P and R-R regular; Atria and ventricles are pacing independently of one another; complete AV dissociation | Upright and uniform; more p waves than QRS | None; No relationship between P's and QRS's | < 0.12 seconds |