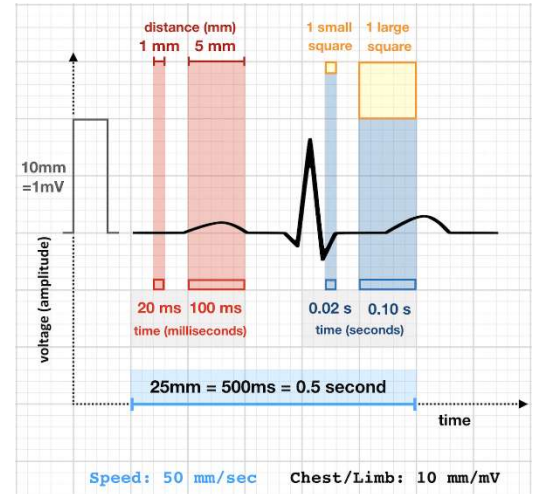
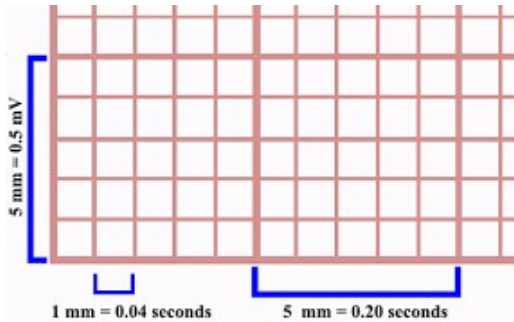




Telemetry – Systemic Approach to Analyzing EKG Rhythms

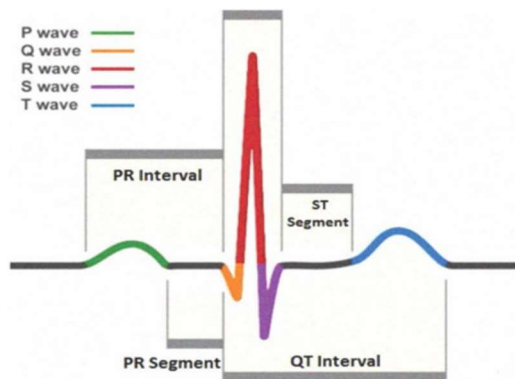
Graph Paper:

- 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



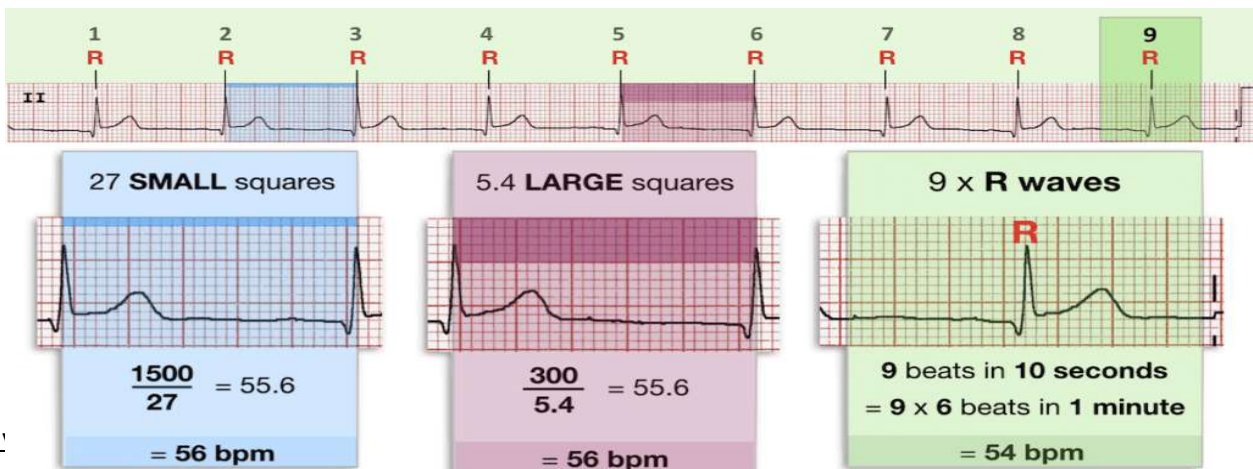
5 Steps to Identifying Rhythms:

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

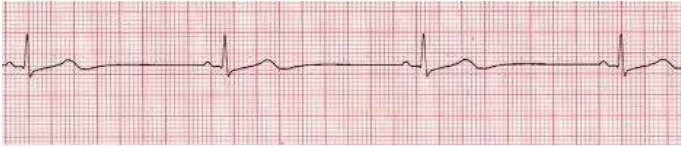
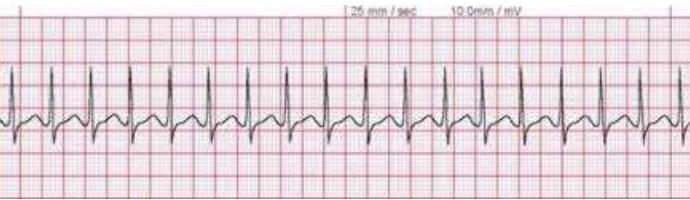
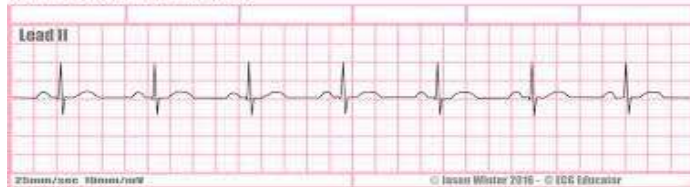


Figure 2. Atrial fibrillation on an electrocardiogram



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?

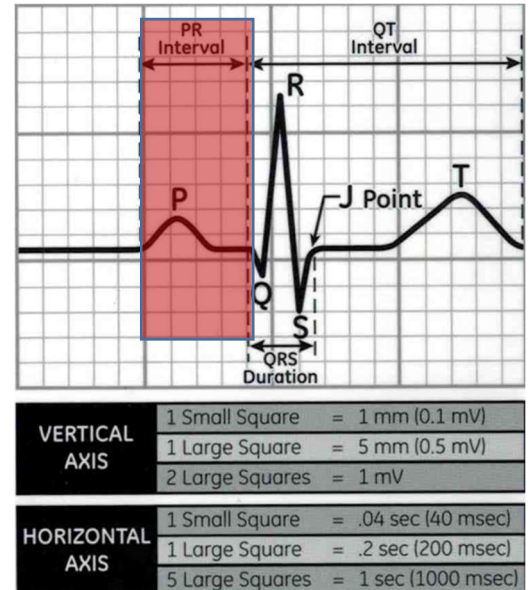




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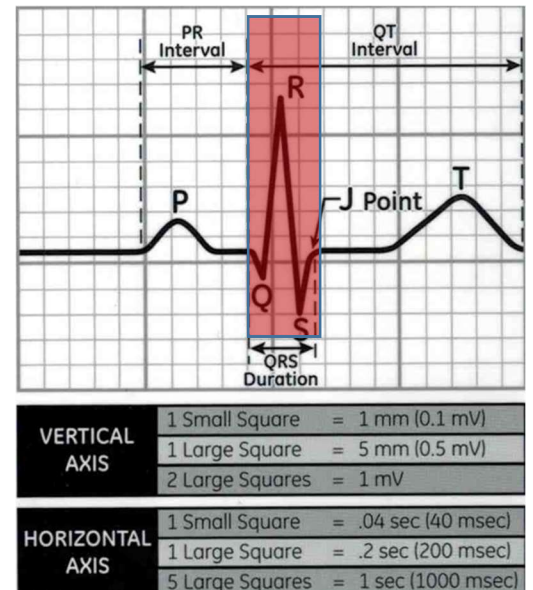
PR Interval:

- 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