EKG Interpretation for the General Practitioner:

Simplifying a Complicated Diagnostic

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Consultant for HESKA

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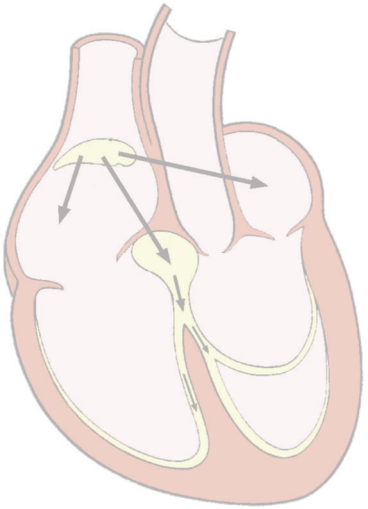
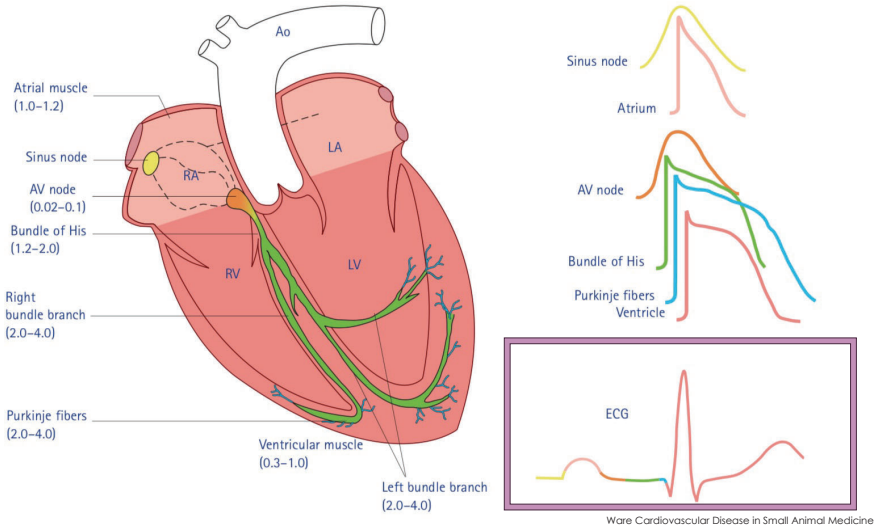
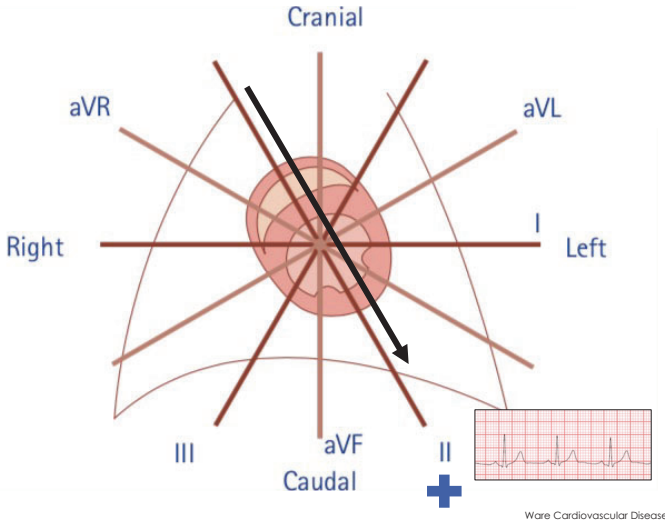
EKG Interpretation Steps

1) What is the HR?
2) Regular or Irregular?
3) P for every QRS?
4) QRS for every P?
5) Is the PR interval consistent?
6) QRS morphology?
7) T's tall/tented?





Ware Cardiovascular Disease in Small Animal Medicine



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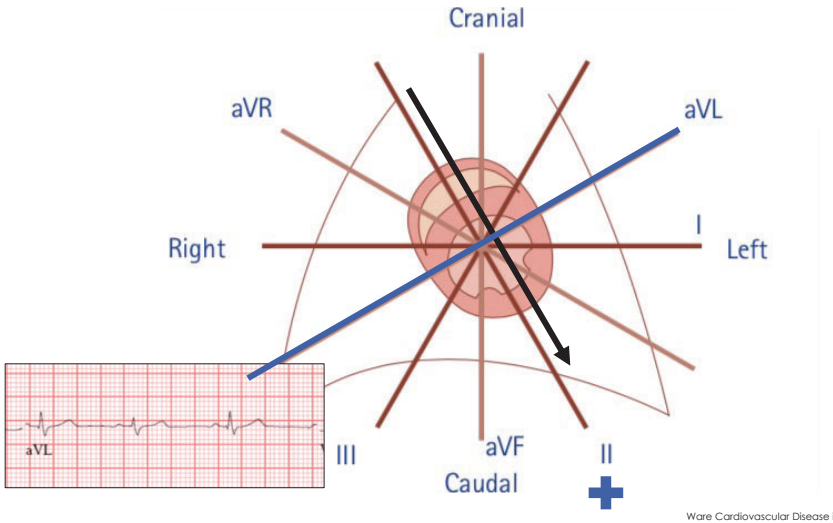

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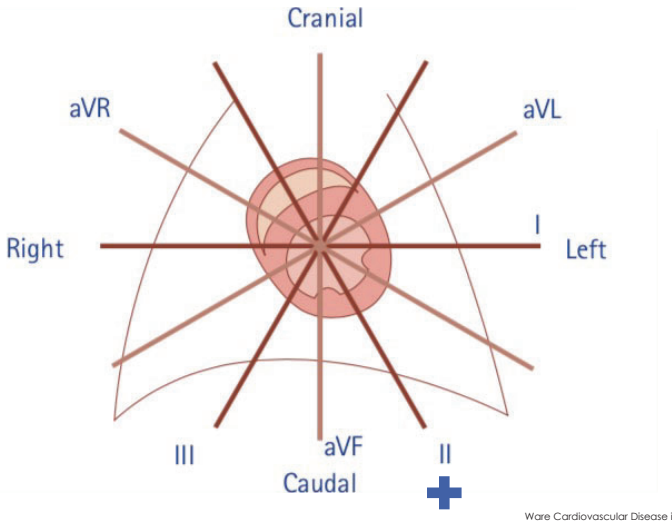
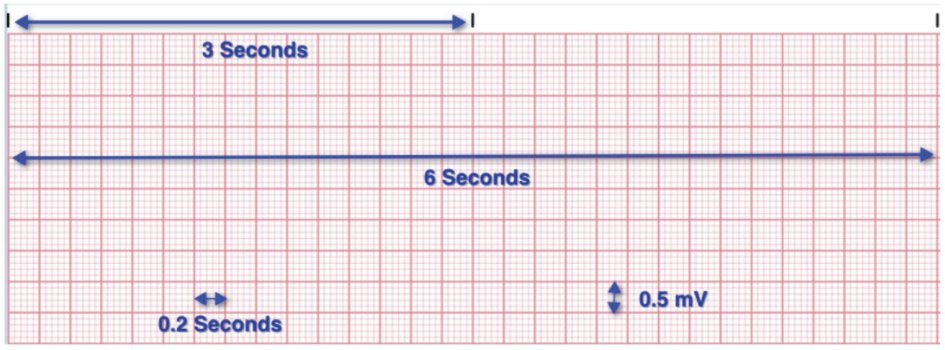
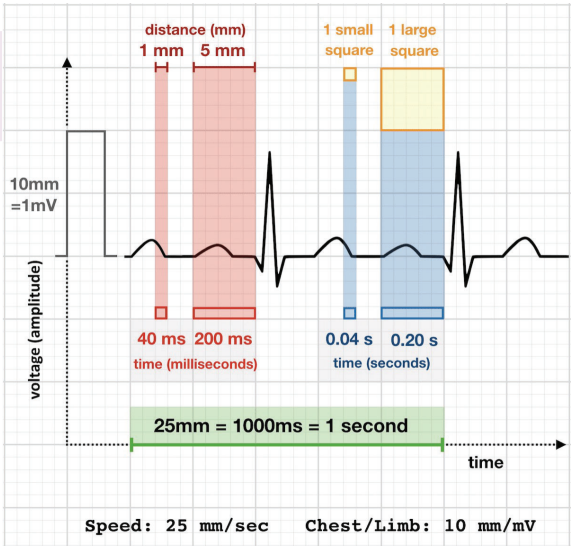


Ware Cardiovascular Disease in Small Animal Medicine

EKG Interpretation: EKG Paper



https://www.practicalclinicalskills.com/ekg-lesson?coursecaseorder=1&courseid=301



25 mm/sec

1500 little boxes in 1 minute

50 mm/sec

3000 little boxes in 1 minute

https://litfl.com/ecg-rate-interpretation/

EKG Interpretation Steps

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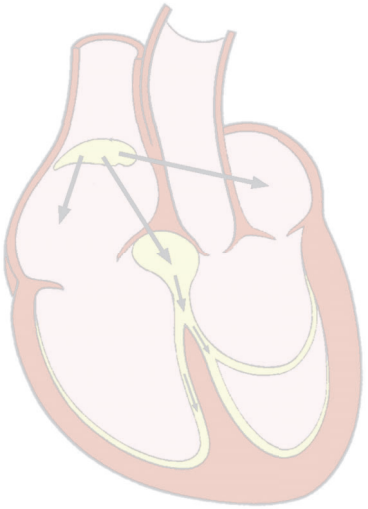
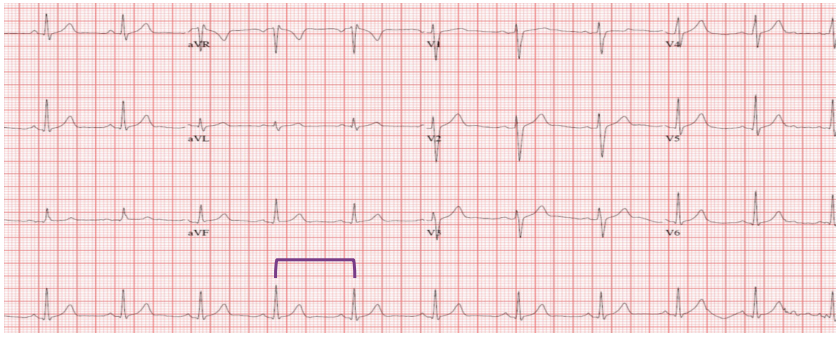


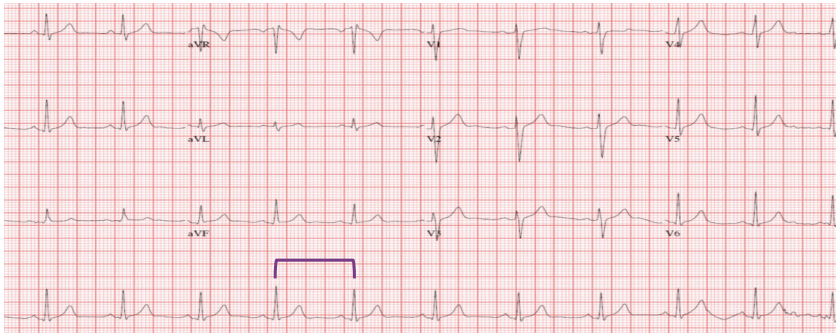
EKG: Instantaneous Heart Rate

25mm/sec Heart Rate (BPM) = 1500 / # of little squares in the R-R interval
Heart Rate (BPM) = 1500 / 20 = 75 BPM



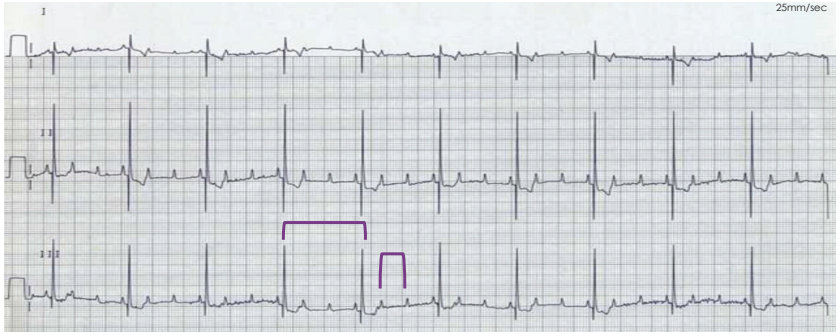
EKG: Instantaneous Heart Rate

50mm/sec Heart Rate (BPM) = 3000 / # of little squares in the R-R interval
Heart Rate (BPM) = 3000 / 20 = 150 BPM

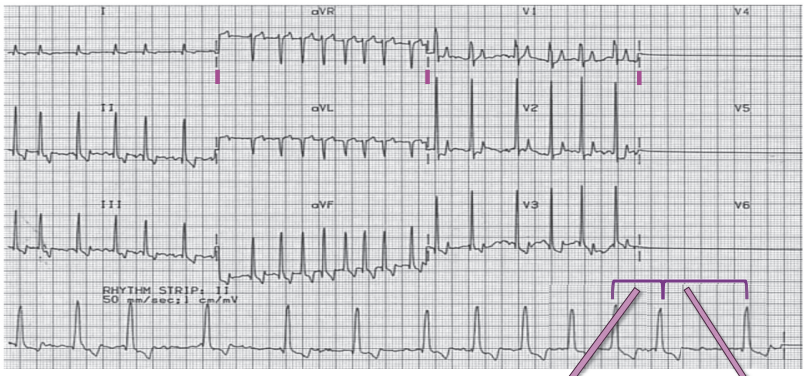


EKG: Instantaneous Heart Rate

Heart Rate (BPM) = 1500 / # of little squares in the R-R interval
Atrial Rate (166) versus Ventricular Rate (62)



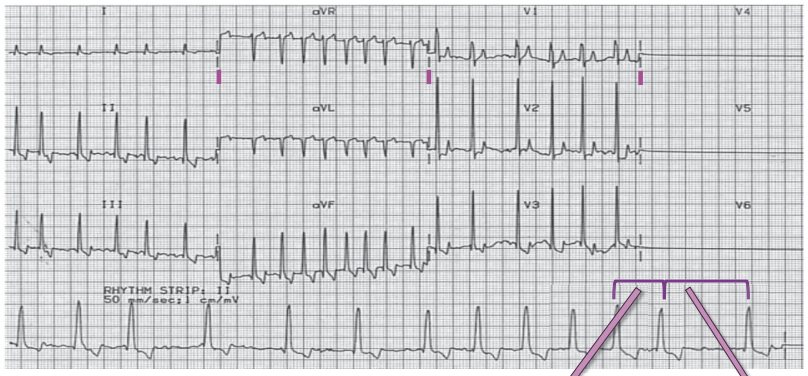
EKG: Instantaneous Heart Rate



HR = 3000/15 blocks

HR= 3000/25 blocks

EKG: Instantaneous Heart Rate

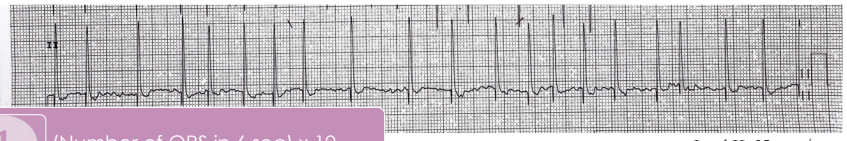


HR = 3000/15 = 200 bpm

HR = 3000/25 = 120bpm

EKG: Heart Rate

3 seconds | 3 seconds | 3 seconds



Lead II, 25 mm/sec

1. (Number of QRS in 6 sec) x 10
2. Pen x 10
3. (QRS on rhythm strip) x 6

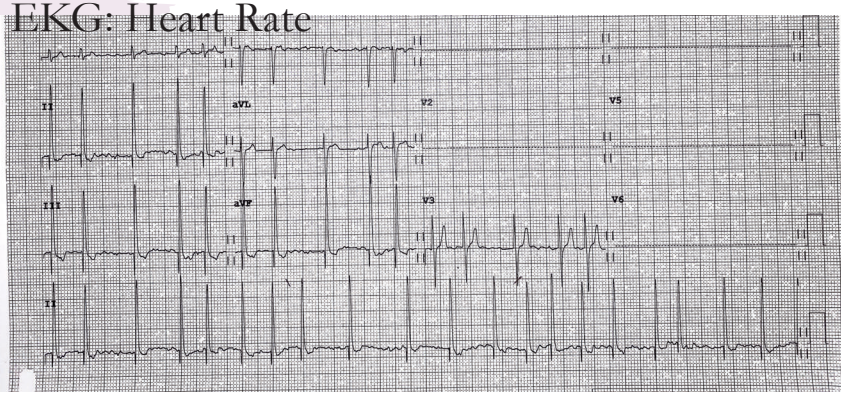
EKG: Heart Rate

I

II

III

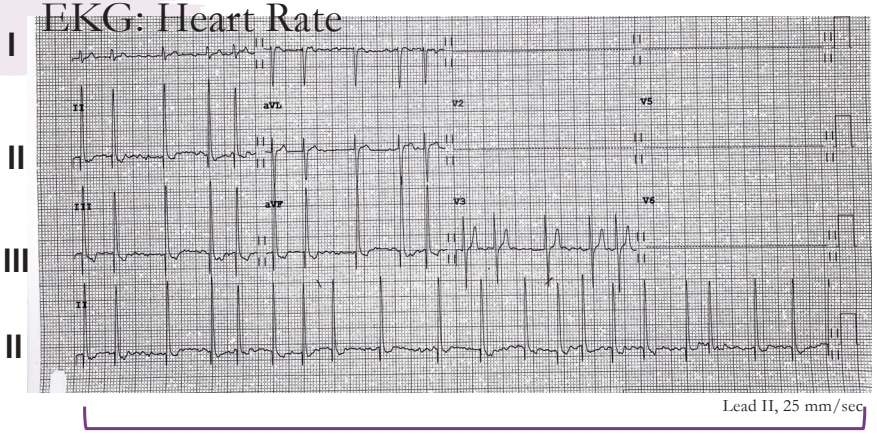
II



Lead II, 25 mm/sec

10 seconds

EKG: Heart Rate



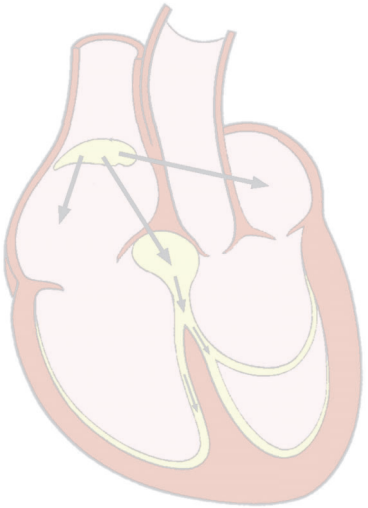
HR = Number of beats in 10 seconds x 6

Heart Rate Determination

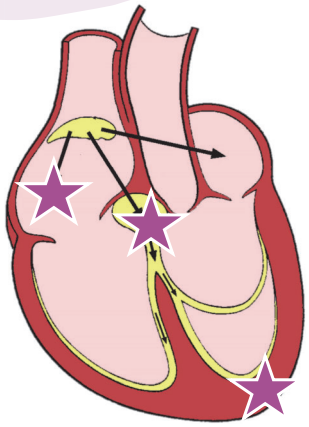
1. (Number of QRS in 6 sec) x 10
2. Pen x 10
3. (QRS on rhythm strip) x 6
4. Instantaneous

EKG Interpretation Steps

1) What is the HR?
2) Regular or Irregular?
3) P for every QRS?
4) QRS for every P?
5) Is the PR interval consistent?
6) QRS morphology?
7) T's tall/tented?

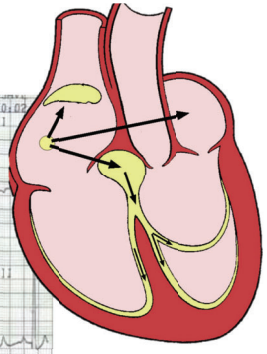


EKG: Regular vs Irregular



- Premature beats = occurs early in the sequence of underlying rhythm
- Ectopic pacemaker fires earlier than the SA node
  - Atrial
  - Junctional
  - Ventricular

EKG: Atrial Premature Beats



EKG: Atrial Premature Beats

EKG: Atrial Premature Beats

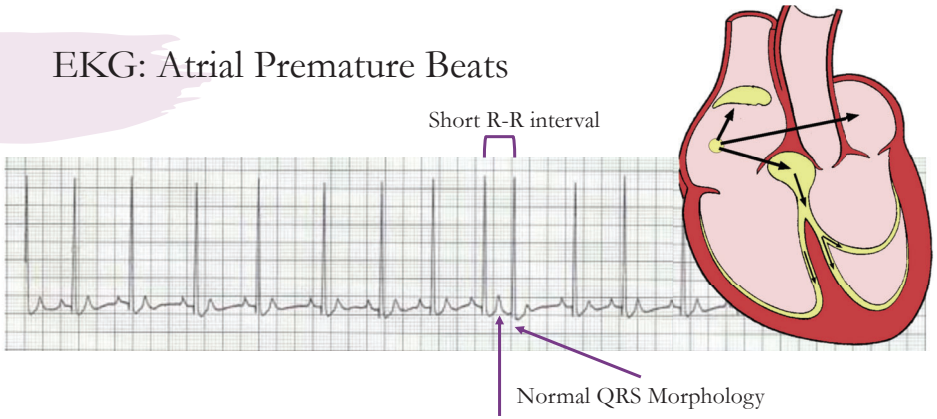
Short R-R interval

EKG: Atrial Premature Beats

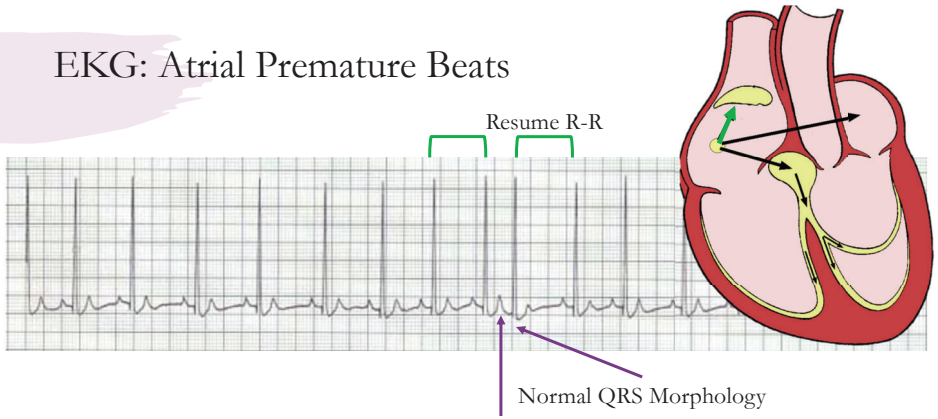
Short R-R interval

P wave buried
P may have different morphology

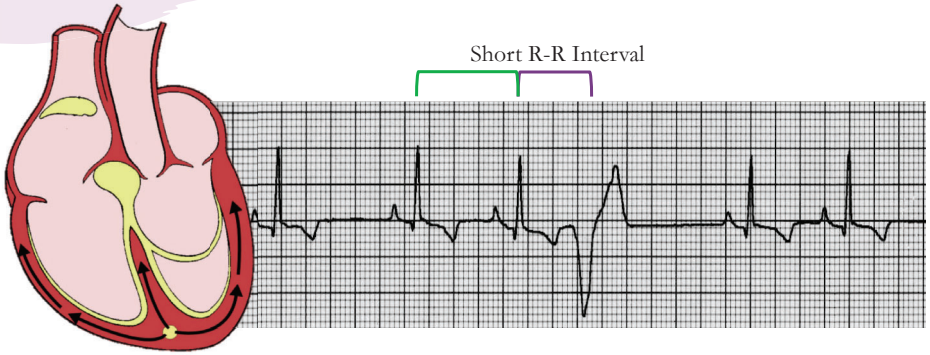
EKG: Atrial Premature Beats



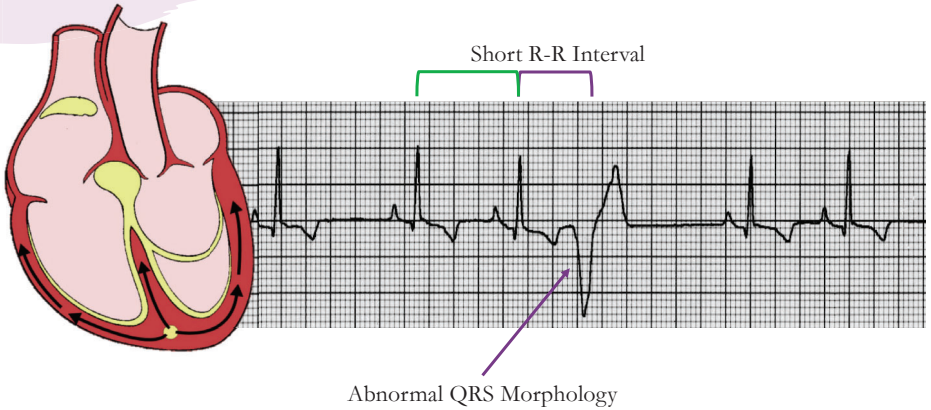
EKG: Atrial Premature Beats



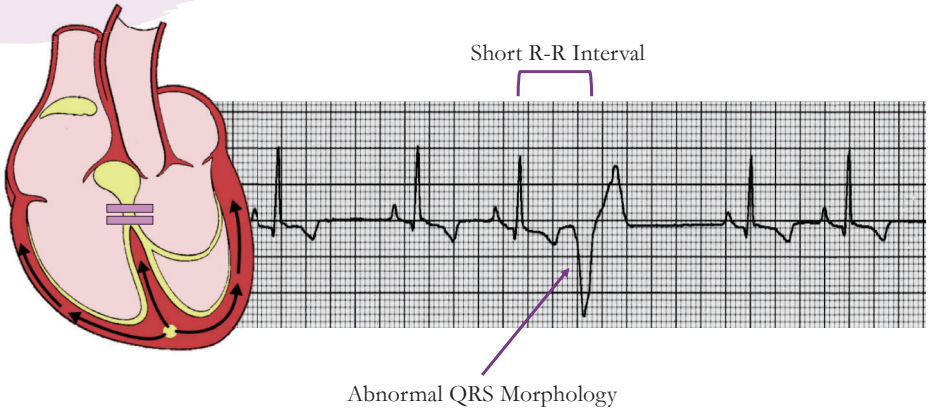
EKG: Ventricular Premature Beat



EKG: Ventricular Premature beat

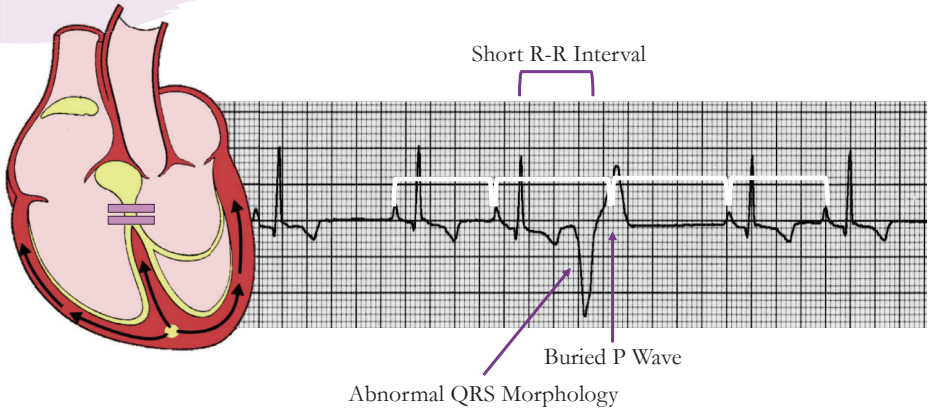


EKG: Ventricular Premature beat



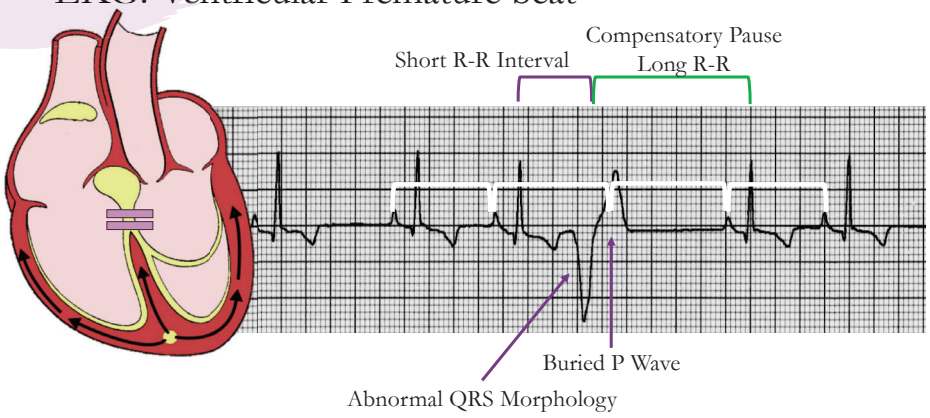
https://canadawestvets.com/symposium2011

EKG: Ventricular Premature beat



https://canadawestvets.com/symposium2011

EKG: Ventricular Premature beat



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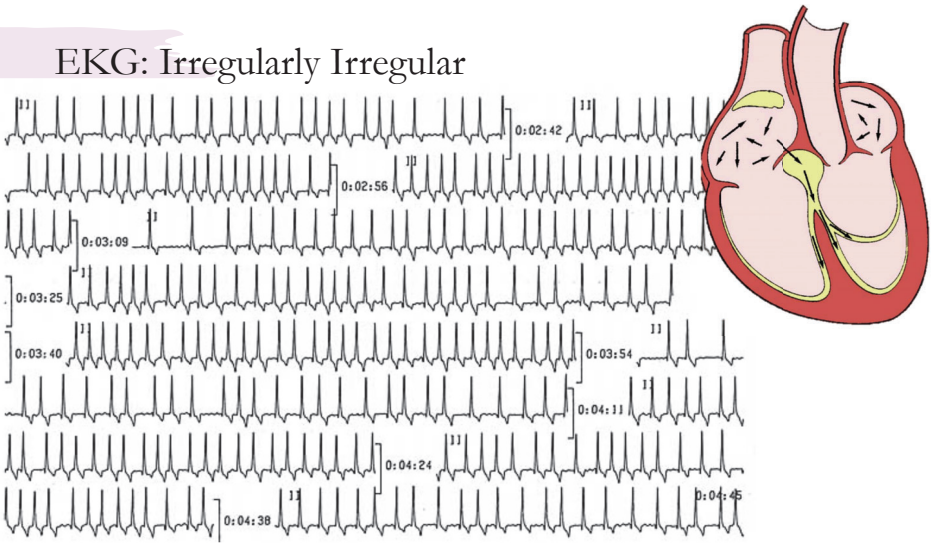
EKG: Ventricular Escape Beats

Ware. Cardiovascular Disease in Small Animals

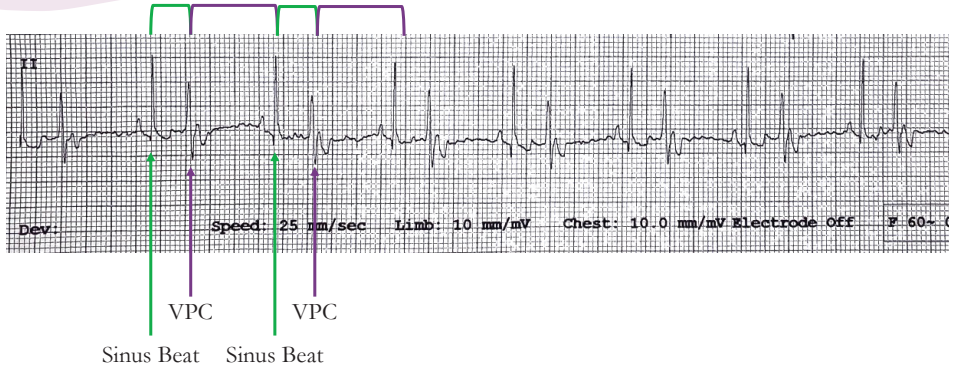
EKG: Ventricular Escape Beats

Ware. Cardiovascular Disease in Small Animals

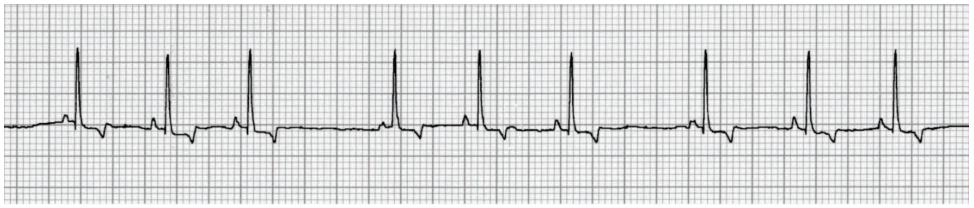
EKG: Irregularly Irregular



EKG: Regularly Irregular



EKG: Regularly Irregular



Lead II
25mm.sec

https://canadawestvets.com/symposium2011/

EKG: Regularly Irregular

Inspiration **Exhalation** **Inspiration** **Exhalation**

https://canadawestvets.com/symposium2011/

EKG Interpretation Steps

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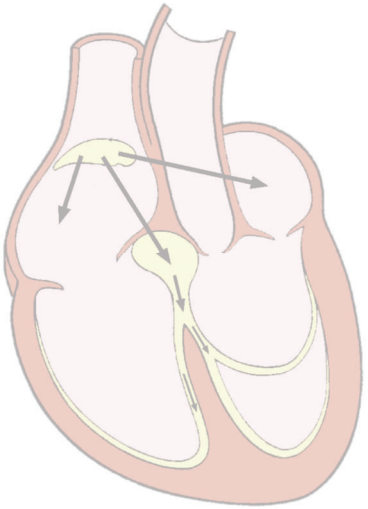
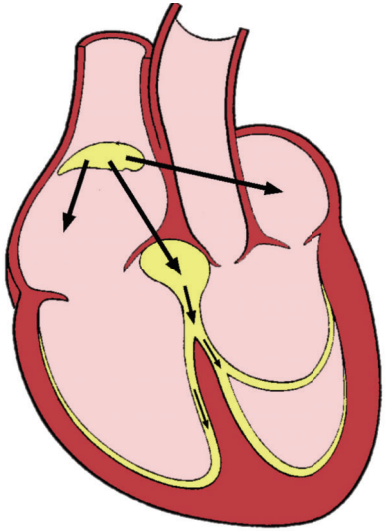
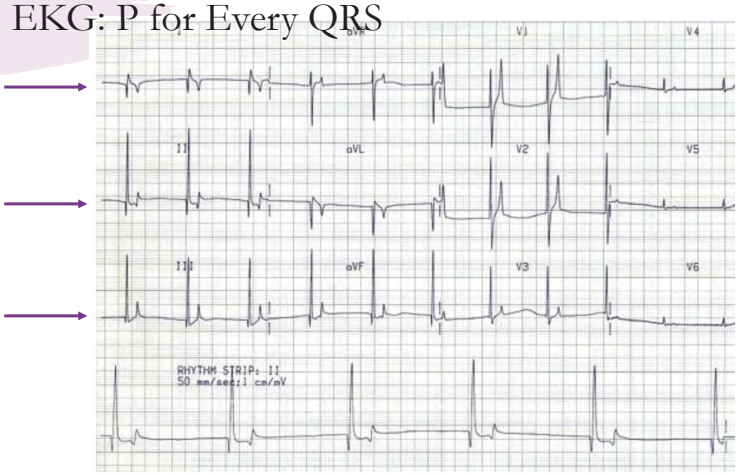


EKG: P for Every QRS

Is the atria in charge and controlling the ventricles?

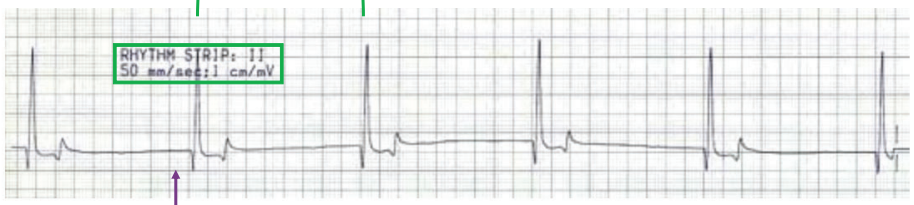


EKG: P for Every QRS



EKG: P for Every QRS

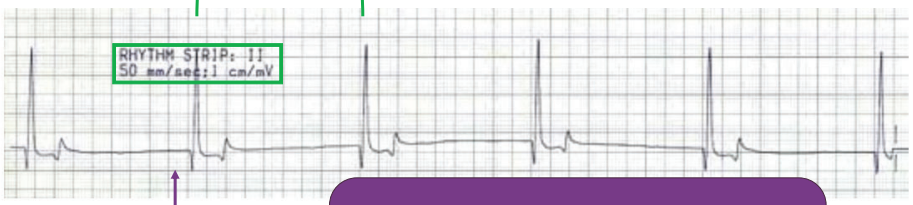
HR = 3000/45 blocks = 66 bpm



No P Waves

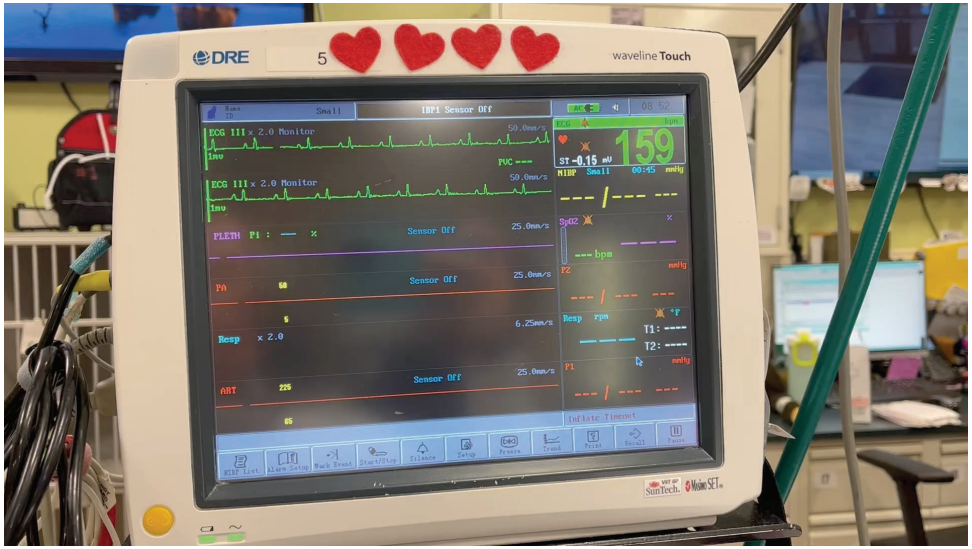
EKG: P for Every QRS

HR = 3000/45 blocks = 66 bpm



No P Waves

Differential Diagnoses
1. Hyperkalemia
2. Atrial Standstill
3. Sinoatrial Node Block



EKG: P for Every QRS

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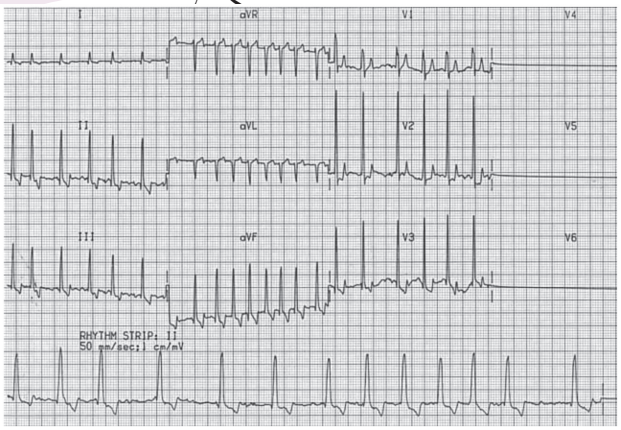
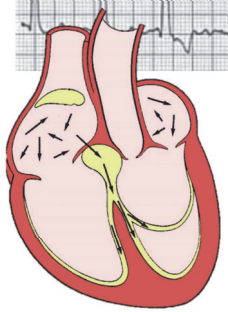
EKG: P for Every QRS?



Vetcardiology.org

EKG: P for Every QRS?



Atrial Fibrillation

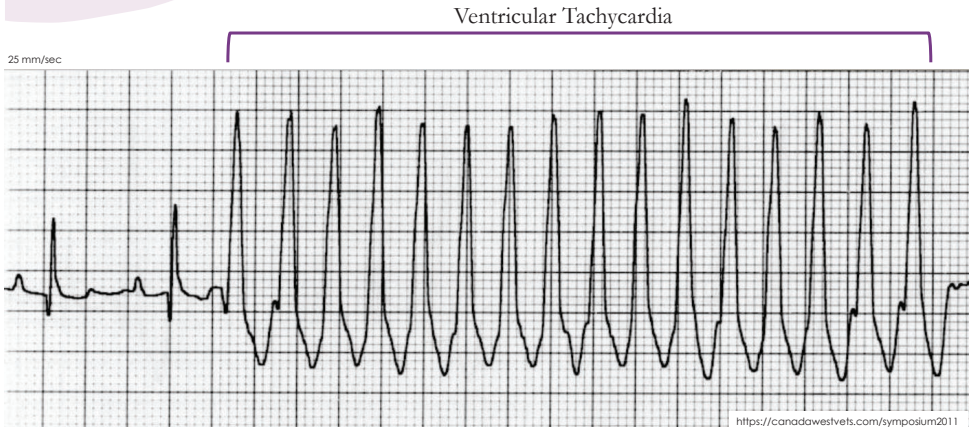
1. No P waves
2. F waves on baseline
3. Tachycardia
4. Irregular

Vetcardiology.org

Atrial Fibrillation

- Etiology
  - LA enlargement
  - Giant breeds
- Persistent
- Ventricular response rate
  - Sympathetic tone
  - Conduction velocity of AV node

EKG: P for Every QRS?



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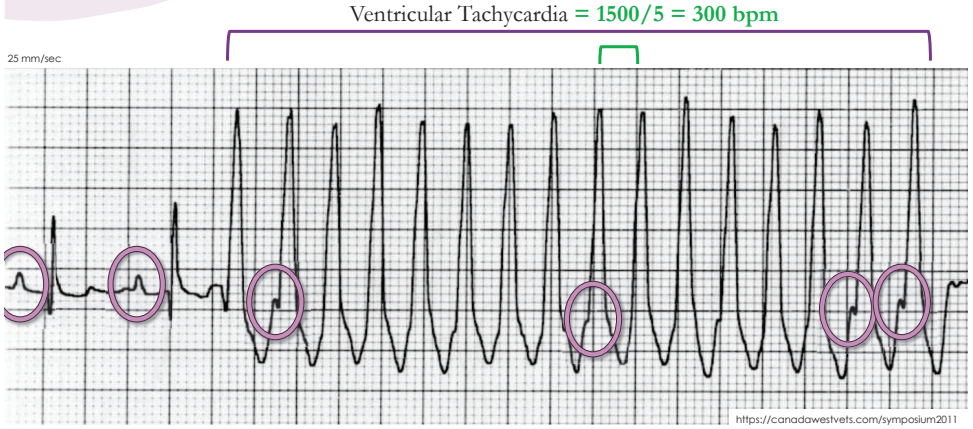
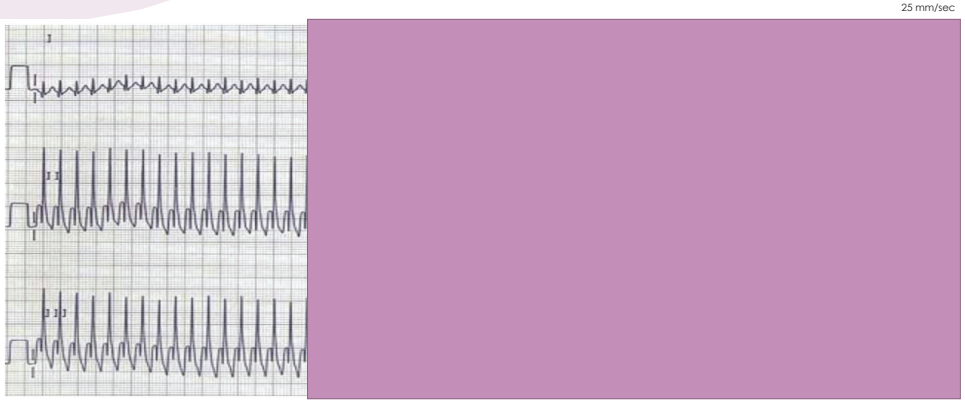


P for Every QRS?



Vagal Maneuver: Supraventricular Tachycardia

Smith, et al. Journal of Vet Cardio. 2013. 15: 33-40
Veterinariankev.com

P for Every QRS?

P for Every QRS?

P for Every QRS?

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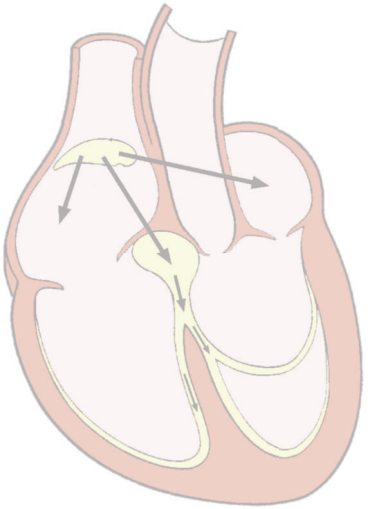
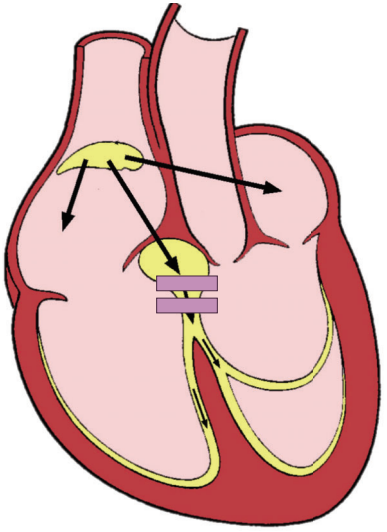


EKG: QRS for Every P

Are the ventricles responding to the atria or is there an AV Blockade?



EKG: QRS for Every P?

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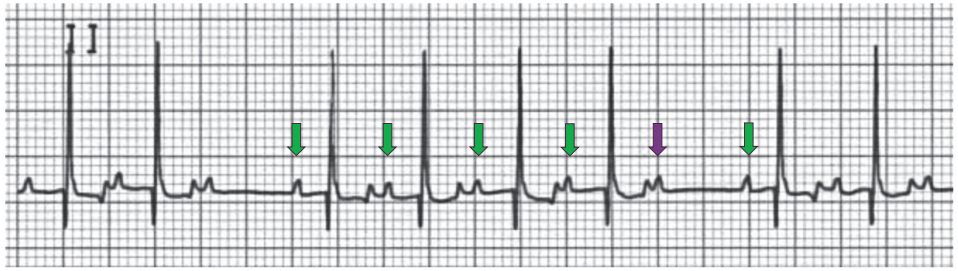
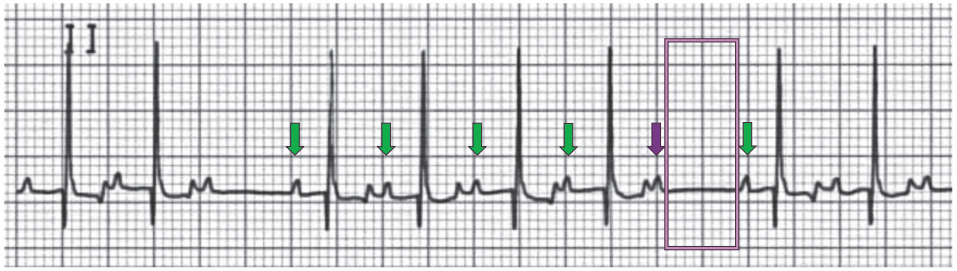


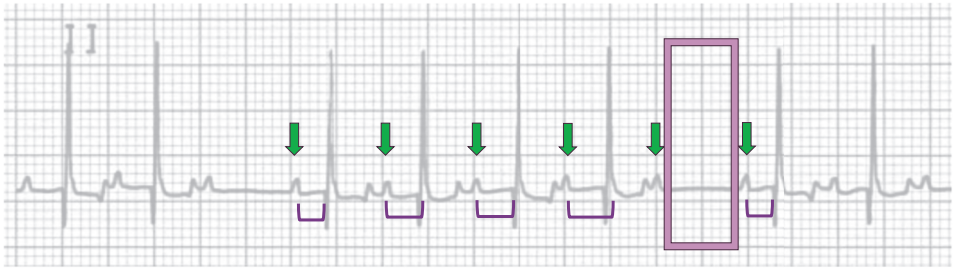
EKG: QRS for Every P?



Second Degree AV Block
Dropped QRS Complex

Vetcardiology.org

EKG: QRS for Every P?



Mobitz Type I
Second Degree AV Block
Dropped QRS Complex

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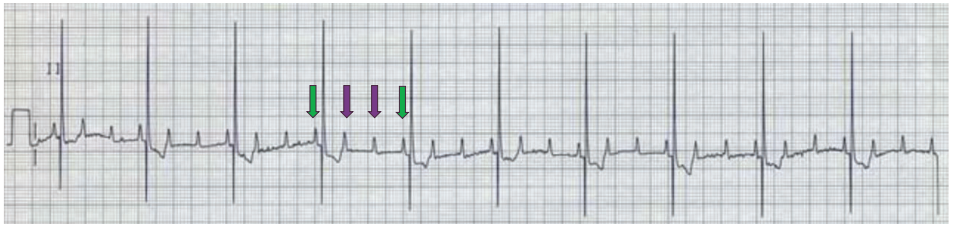
QRS for Every P?

25 mm/sec

QRS for Every P?



25 mm/sec

Second Degree AV Block
Dropped QRS Complexes

QRS for Every P?

25 mm/sec

Mobitz Type II
Second Degree AV Block
Dropped QRS Complexes

QRS for Every P?

25 mm/sec

Mobitz Type II
Second Degree AV Block
3:1 Conduction (3 P waves for each 1 conducted QRS)
Dropped QRS Complexes

QRS for Every P?

25 mm/sec

Mobitz Type II
Second Degree AV Block
3:1 Conduction (3 P waves for each 1 conducted QRS)
Ventricular Rate = 1500/23 = 65 bpm

QRS for Every P?

25 mm/sec

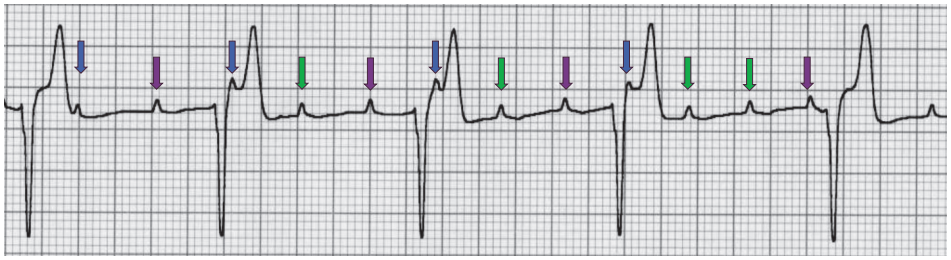
QRS for Every P?

25 mm/sec

QRS for Every P?

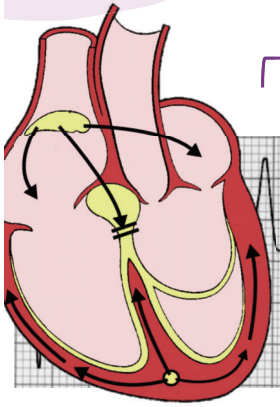
25 mm/sec

QRS for Every P?



25 mm/sec

QRS for Every P?



Third Degree AV Block

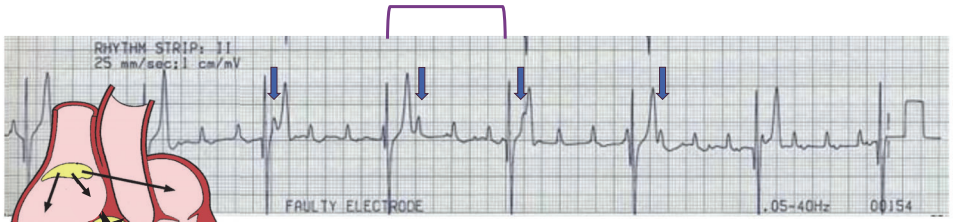
AV Dissociation

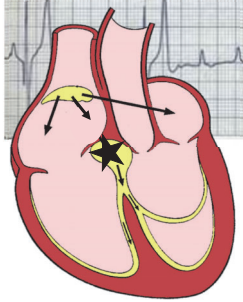
25 mm/sec

EKG: QRS for Every P?

EKG: QRS for Every P?

EKG: QRS for Every P?

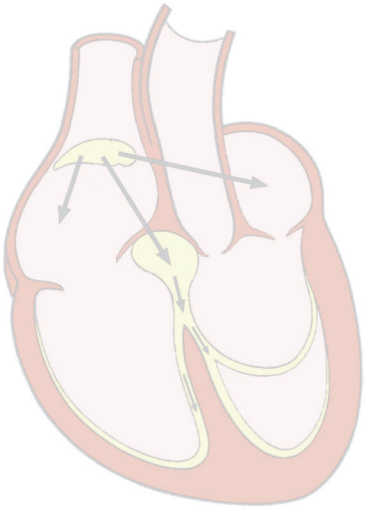




Third Degree AV Block
Junctional Escape
HR = 1500 / 32 = 46 bpm

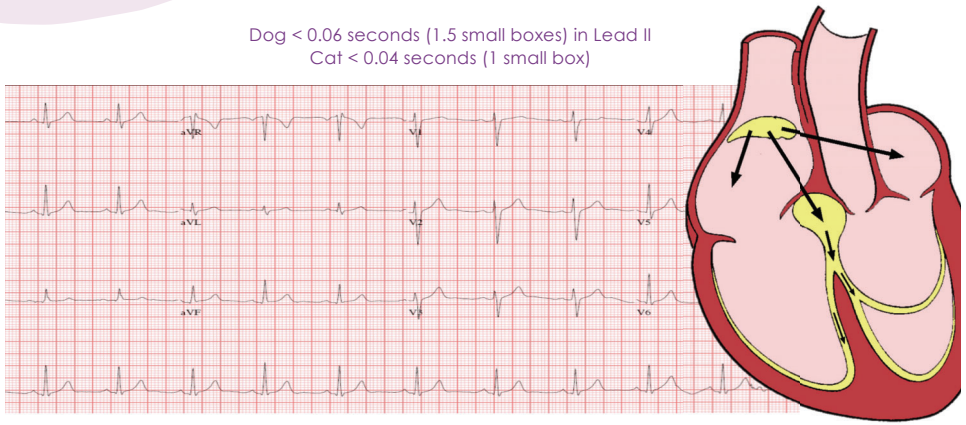
EKG Interpretation Steps

1) What is the HR?
2) Regular or Irregular?
3) P for every QRS?
4) QRS for every P?
5) Is the PR interval consistent?
6) QRS morphology?
7) T's tall/tented?

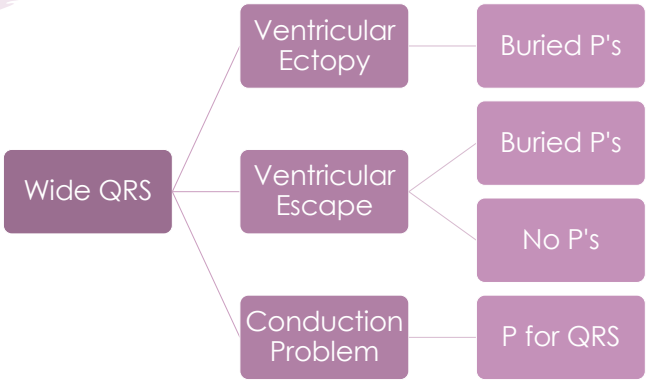


QRS Morphology

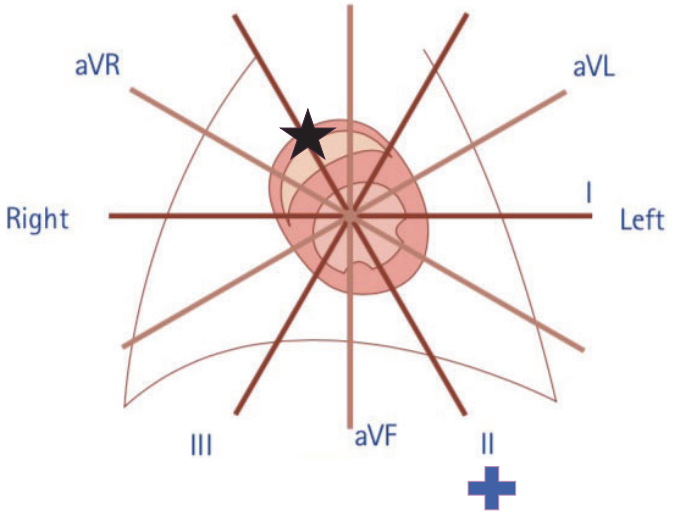
Dog < 0.06 seconds (1.5 small boxes) in Lead II
Cat < 0.04 seconds (1 small box)

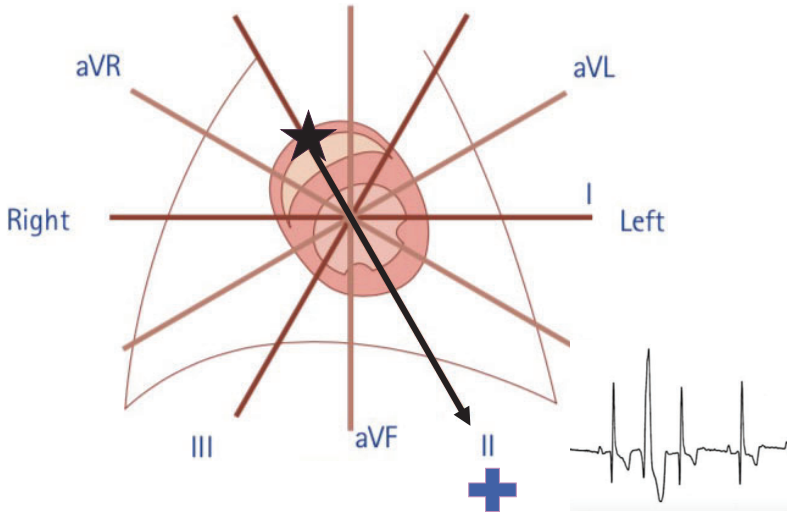


QRS Morphology

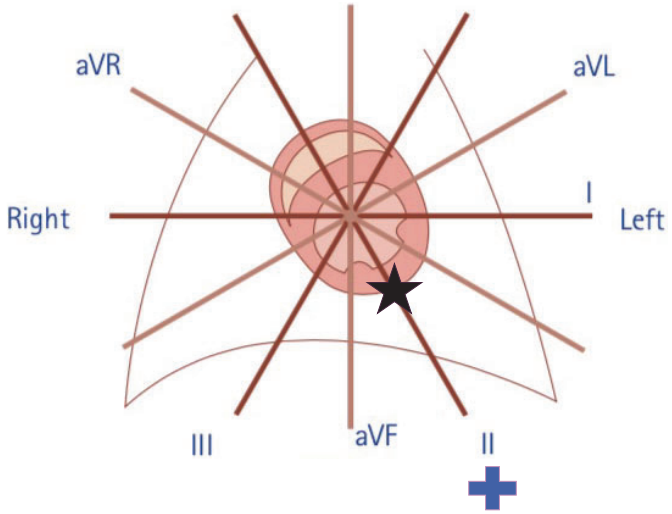


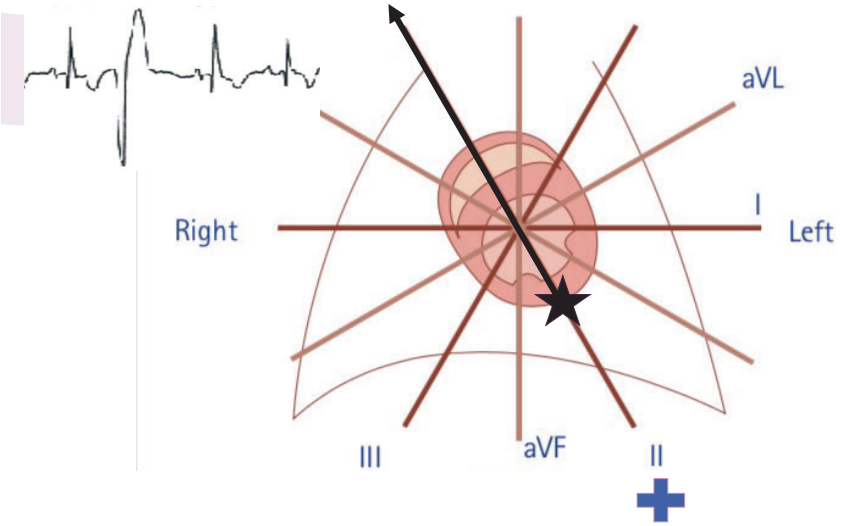
Right Sided Ventricular Ectopy





Left Sided Ventricular Ectopy





QRS Morphology: Wide QRS

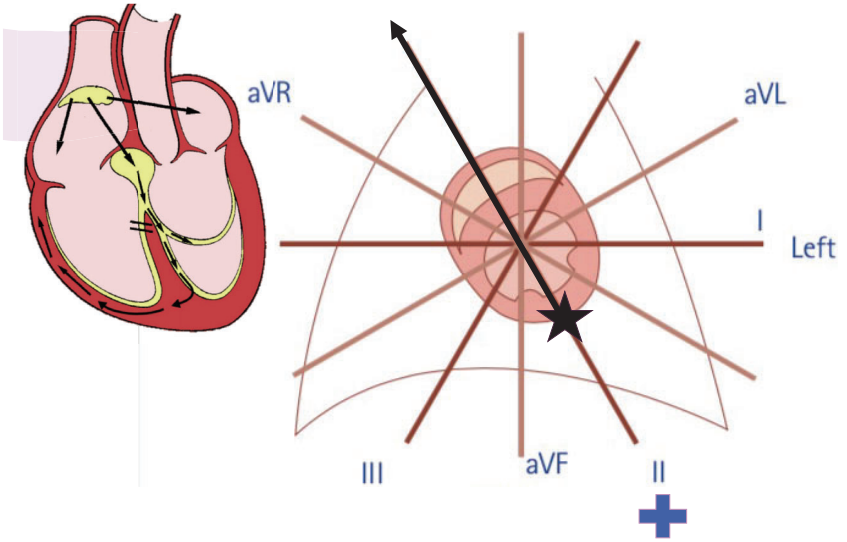
HR = 3000/24 = 125 bpm

QRS Morphology: Wide QRS

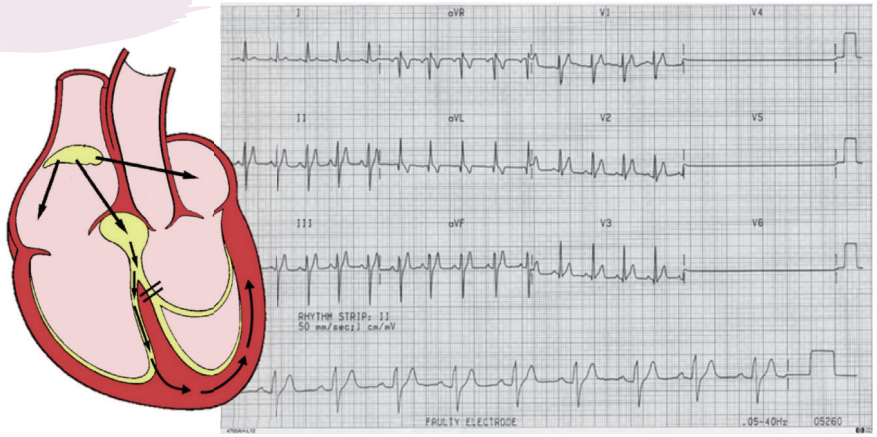
HR = 3000/24 = 125 bpm

P for every QRS – atria are in charge
QRS for every P – ventricles are responding to atria

QRS Morphology: Right BBB

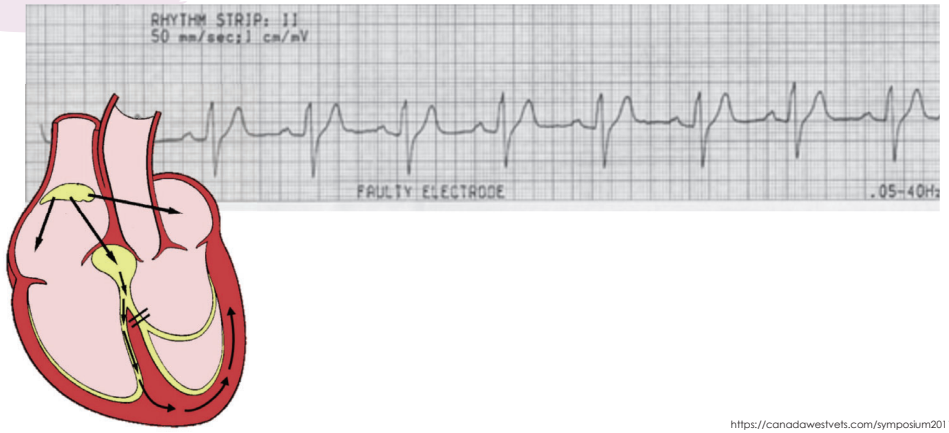


QRS Morphology: Left BBB



https://canadawestvets.com/symposium2011

QRS Morphology: Left BBB



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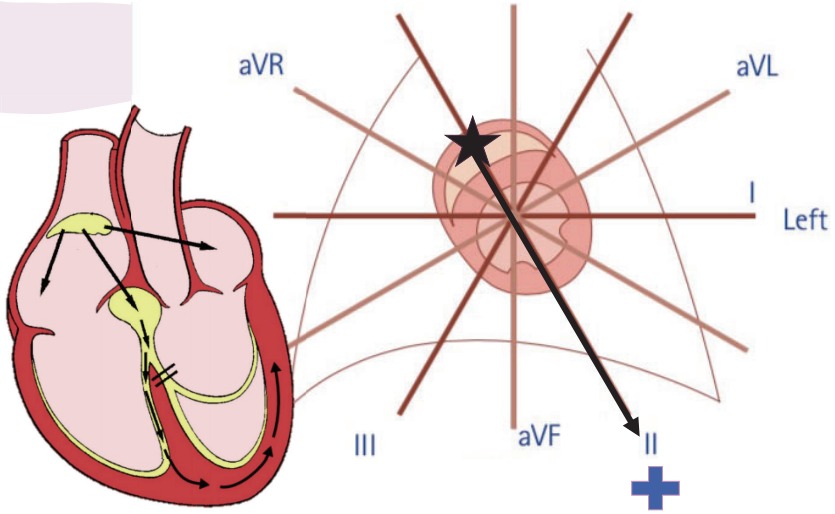
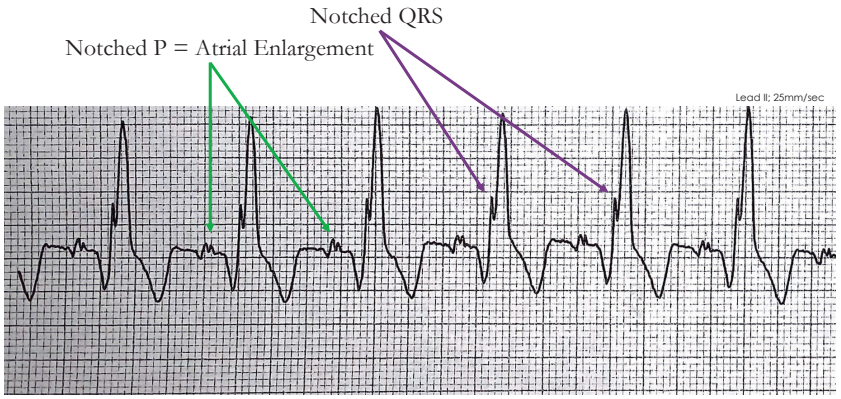


QRS Morphology: Left BBB

Notched QRS = myocardial ischemia, fibrosis

QRS Morphology: Left BBB



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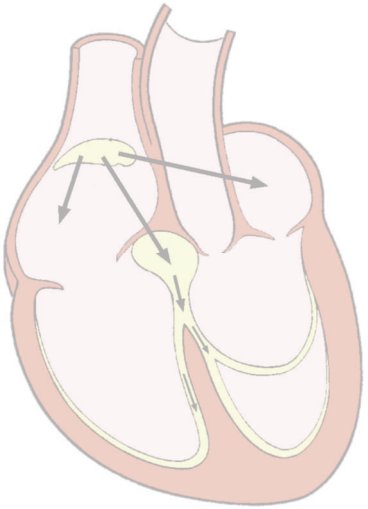
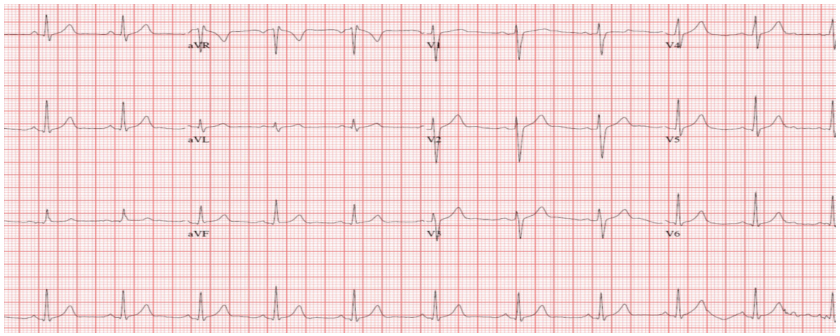
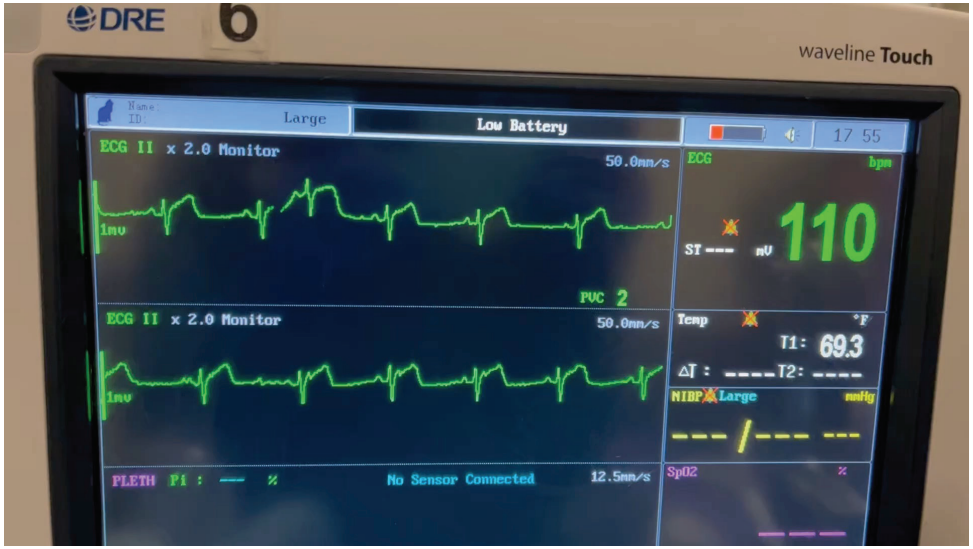


EKG: T Waves

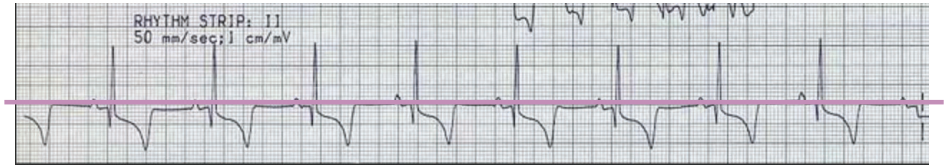
Dog: no greater than ¼ of the R wave amplitude; positive, negative, biphasic
Cat: <0.3 mV (3 small boxes); positive, negative, biphasic





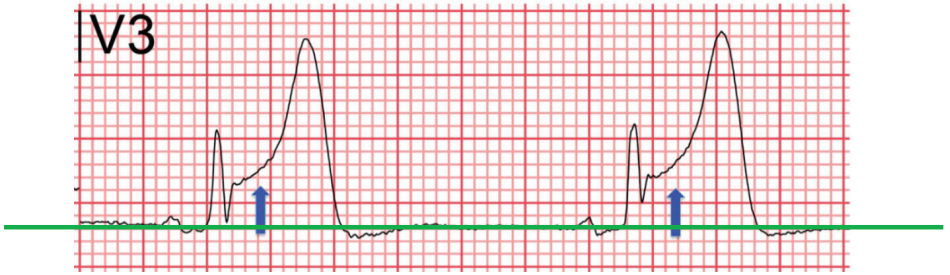
ST Segment Changes: Depression

Subendocardial myocardial injury: poor cardiac perfusion



ST Segment Changes: Elevation

Pericarditis, LV epicardial injury, transmural myocardial infarction



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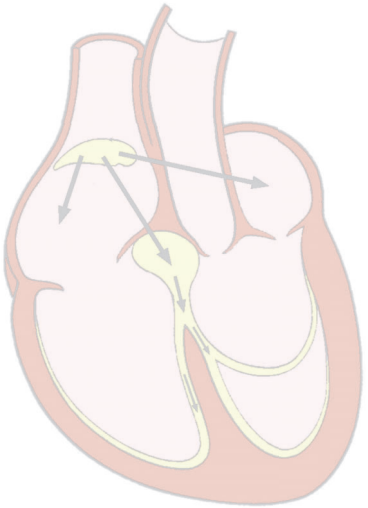

Questions?

Remember to **download the CE certificate** in the handouts panel of the webinar control panel.

NOTE: CE certificate not available for watching the recording.

Questions about CE?
events@heska.com

Questions about topic?
Amanda.Cavanagh@colostate.edu

Thank you for joining us!