

Cardiac Arrhythmias

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Conflict of Interest Disclosures

Speaker: Richard S. Rosenberg, PhD

1. I do not have any potential conflicts of interest to disclose, **OR**

2. I wish to disclose the following potential conflicts of interest

Type of Potential Conflict	Details of Potential Conflict
Consultant	American Association of Sleep Technologists, Natus Medical, Philips Respironics, Atlanta School of Sleep Technology

3. The material presented in this lecture has no relationship with any of these potential conflicts, **OR**

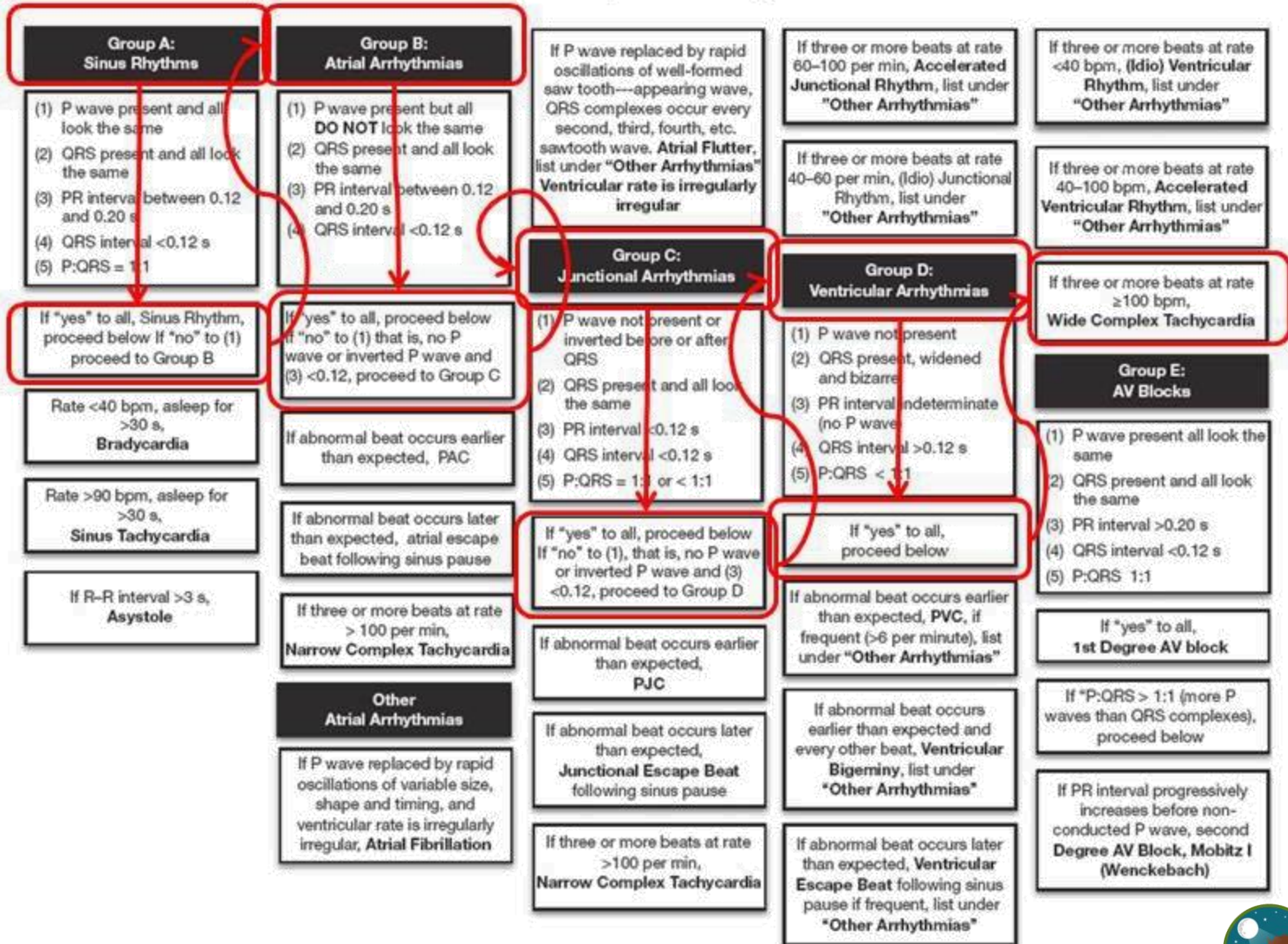
4. This talk presents material that is related to one or more of these potential conflicts, and the following objective references are provided as support for this lecture:

- 1.
- 2.
- 3.

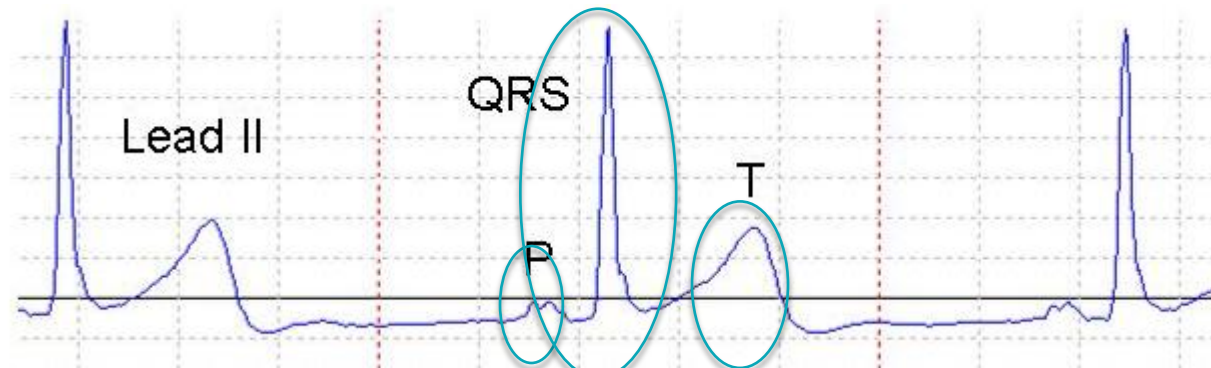
Objectives

- Recognize normal vs abnormal ECG rhythms
- Determine and apply appropriate interventions
- Additional: score ECG rhythms in accordance with AASM Scoring Manual requirements

Cardiac Arrhythmias Algorithm



Elements of the ECG

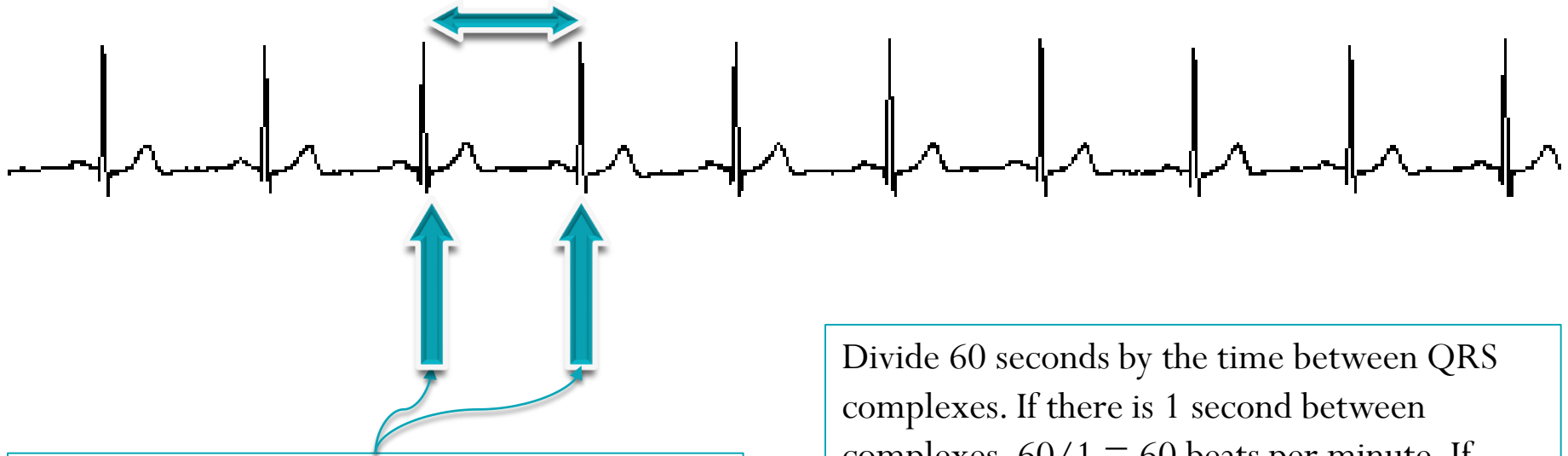


This is the P wave. It comes from the atrium of the heart and indicates a sinus rhythm.

This is the QRS complex. This is the part of the heart beat when blood is pumped.

This is the T wave. The heart is getting ready for another beat.

Calculating Heart Rate

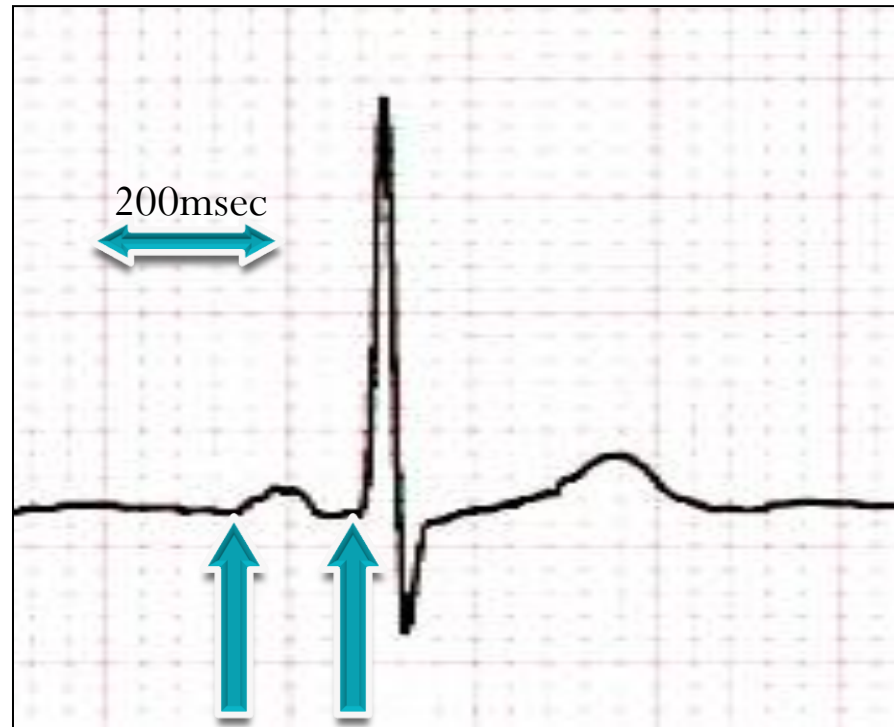


Measure the time between QRS complexes in seconds (the dots are 1 second apart).

Divide 60 seconds by the time between QRS complexes. If there is 1 second between complexes, $60/1 = 60$ beats per minute. If there are 2 seconds, $60/2 = 30$ beats per minute.

Measuring the PR Interval

Measure the distance between the start of the P wave and the beginning of the QRS complex. You will need a 10 or even 5 second window to do this accurately.



A duration of 200 milliseconds (0.2 seconds) is the cutoff: if it is longer, the conduction is delayed.

Measuring the QRS Duration

Measure the distance between the start of the Q wave and the end of the S wave. You will need a 10 or even 5 second window to do this accurately.



A duration of 120 milliseconds (0.12 seconds) is the cutoff: if it is longer, the wave is wide complex, and if it is shorter, the wave is narrow complex (this example is a narrow complex at 0.088 seconds or 88 milliseconds).

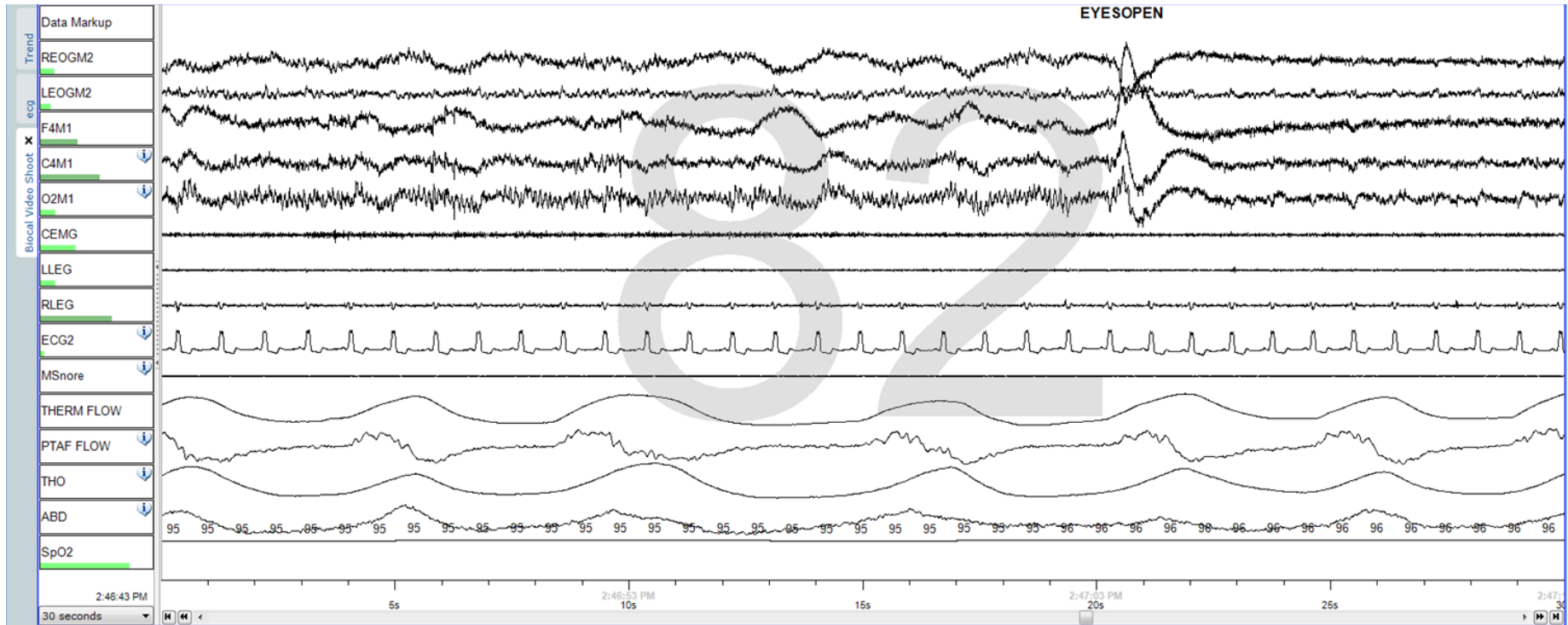
Scoring Cardiac Events

1. Score sinus tachycardia during sleep for a sustained sinus heart rate of greater than 90 beats per minute for adults. N3,N4
2. Score bradycardia during sleep for a sustained heart rate of less than 40/minute for ages 6 years through adult. N4
3. Score asystole for cardiac pauses greater than 3 seconds for ages 6 years through adult.
4. Score wide complex tachycardia for a rhythm lasting a minimum of 3 consecutive beats at a rate greater than 100 per minute with QRS duration of greater than or equal to 120 msec.
5. Score narrow complex tachycardia for a rhythm lasting a minimum of 3 consecutive beats at a rate of greater than 100 per minute with QRS duration of less than 120 msec.
6. Score atrial fibrillation if there is an irregularly irregular ventricular rhythm associated with replacement of consistent P waves by rapid oscillations that vary in size, shape, and timing.

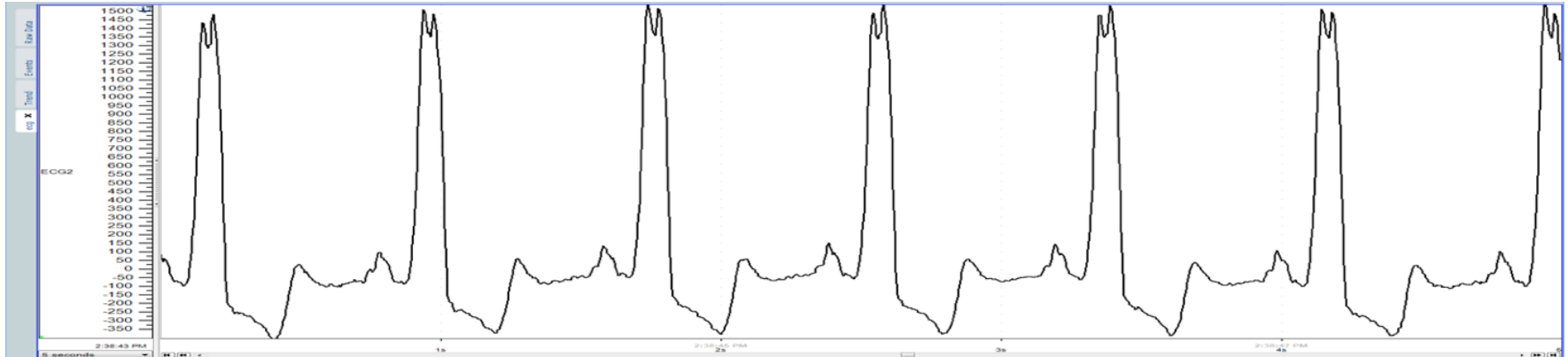
Berry RB, Brooks R, Gamaldo CE, Harding SM, Lloyd RM, Marcus CL and Vaughn BV for the American Academy of Sleep Medicine. *The AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications*, Version 2.3. www.aasmnet.org. Darien, Illinois: American Academy of Sleep Medicine, 2016.



Case #1: 60 Year Old Asymptomatic Male



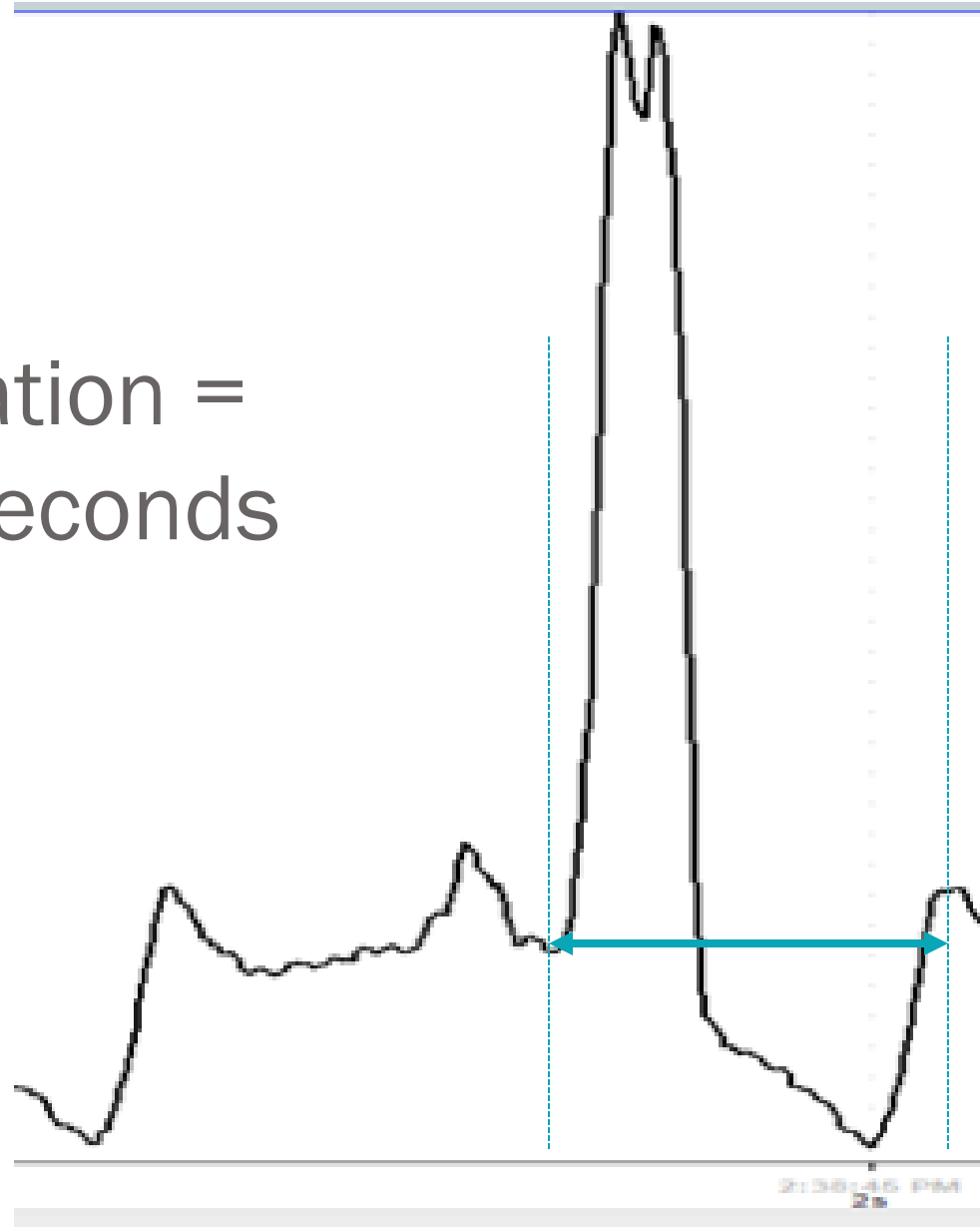
5 Second Window



From the Algorithm

1. P wave present and all look the same
2. QRS present and all look the same
3. PR interval between 0.12 and 0.20 sec
4. QRS interval < 0.12 sec
5. P:QRS = 1:1

QRS Duration =
165 Milliseconds



Identify the ECG – Case #1

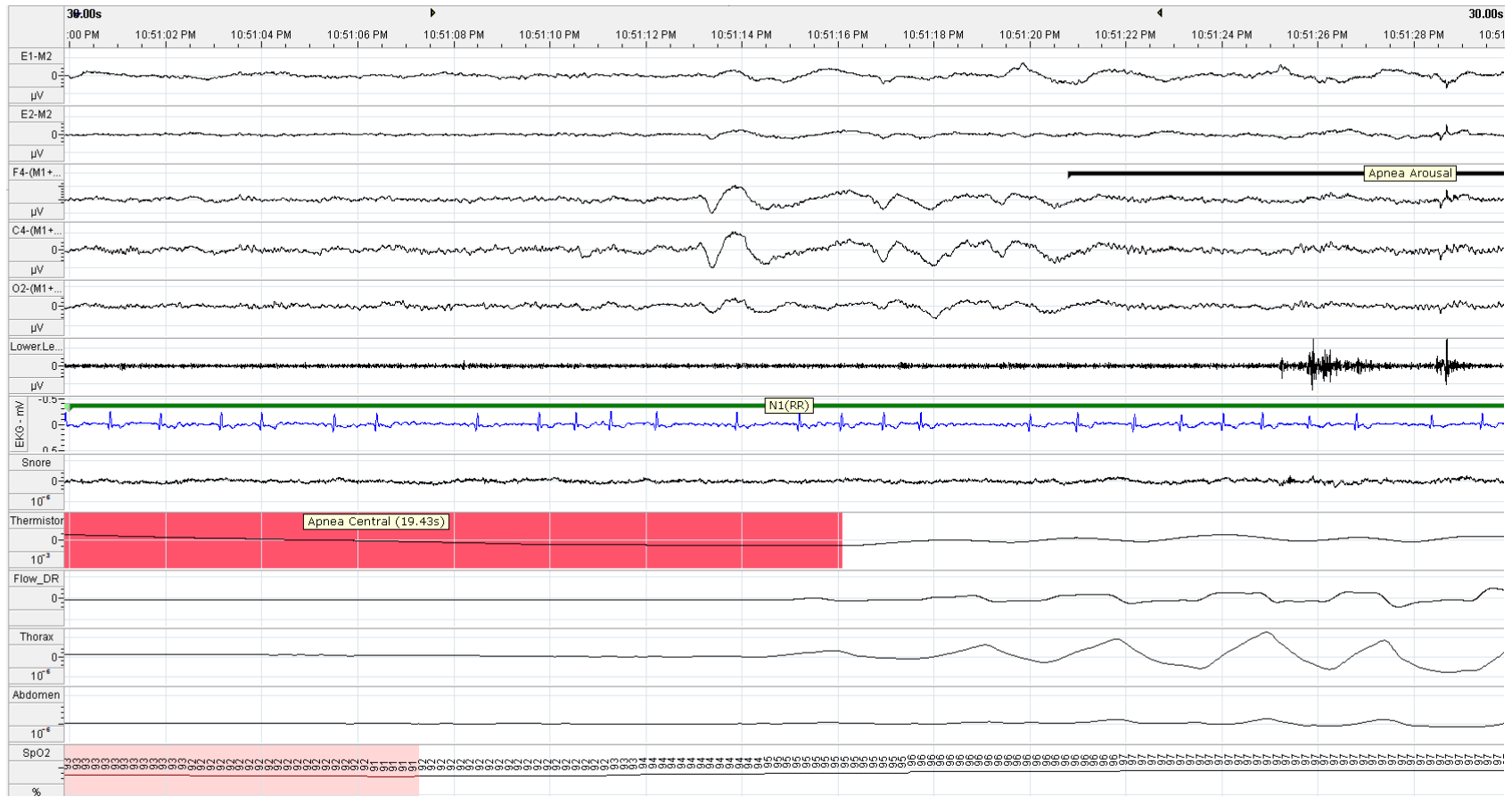
- A. Atrial fibrillation
- B. Left bundle branch block
- C. Premature ventricular contraction
- D. Wenckebach rhythm

Left Bundle Branch Block

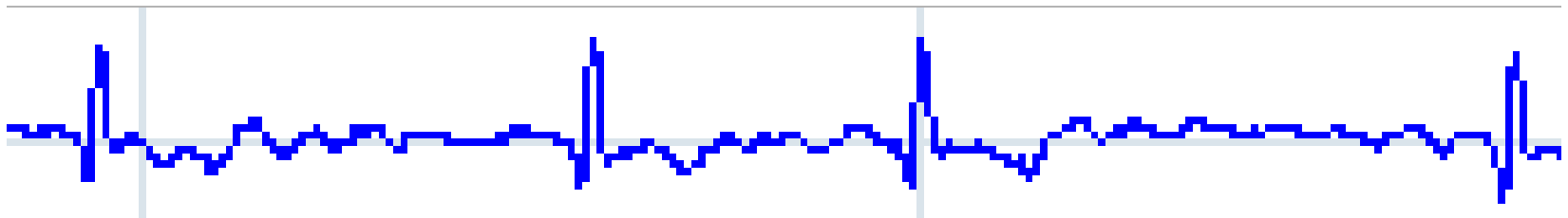
- Rhythm: Regular
 - P wave before each QRS, identical
 - QRS wide: Duration > 0.12 seconds
 - “Appropriate T wave discordance” (does not indicate ischemia)
- Possible causes
 - Aortic stenosis
 - Dilated cardiomyopathy
 - Lyme disease
- Action
 - Monitor closely. In most cases, no action is needed
 - If symptomatic, notify sleep physician on call
 - Ask about dizziness, lightheadedness, chest pain, shortness of breath



Case #2: 80 Year Old Man with CHF



2 Second Window



From the Algorithm

1. P wave present and all look the same
2. QRS present and all look the same
3. PR interval between 0.12 and 0.20 sec
4. QRS interval < 0.12 sec
5. P:QRS = 1:1

Identify the ECG – Case #2

- A. Atrial fibrillation
- B. Paroxysmal tachycardia
- C. Premature atrial contraction
- D. Wenckebach rhythm

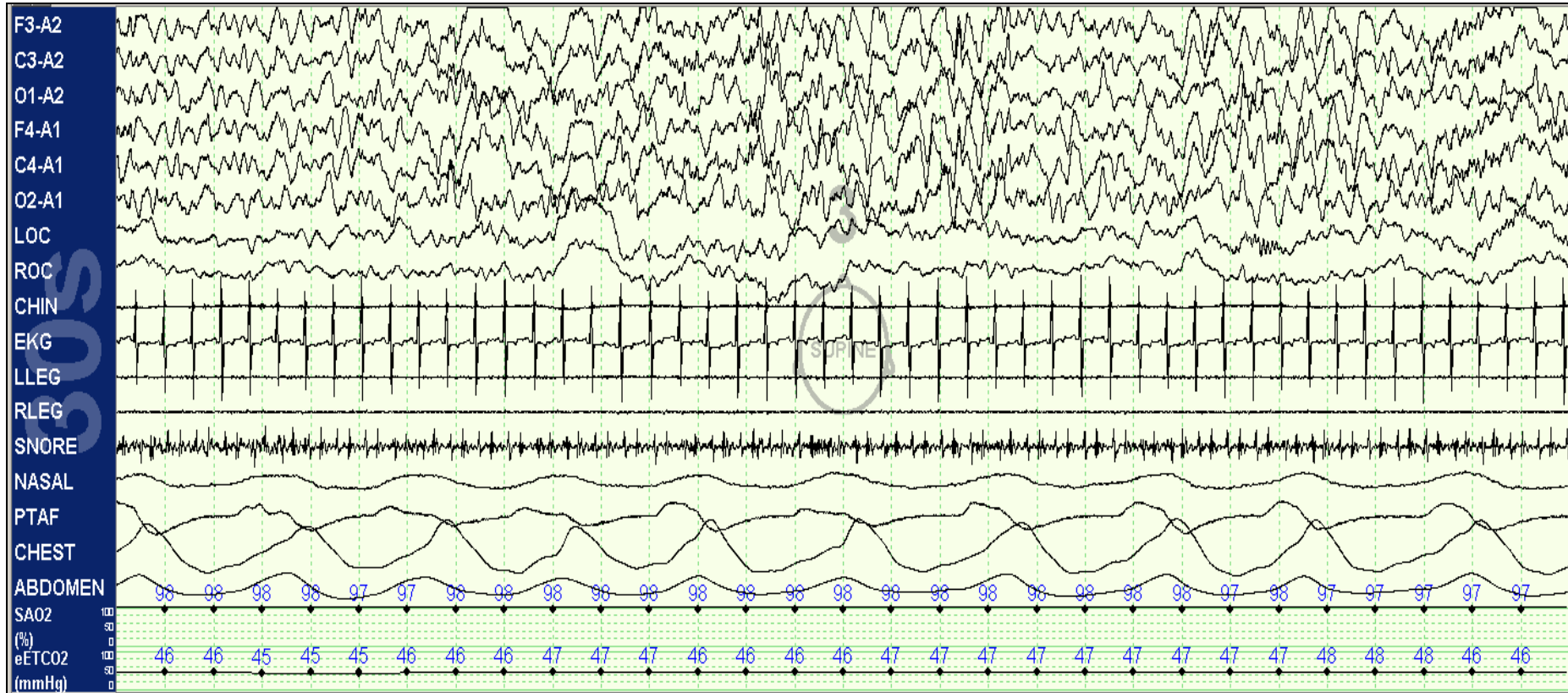
Scoring Cardiac Events

6. Score atrial fibrillation if there is an irregularly irregular ventricular rhythm associated with replacement of consistent P waves by rapid oscillations that vary in size, shape, and timing.

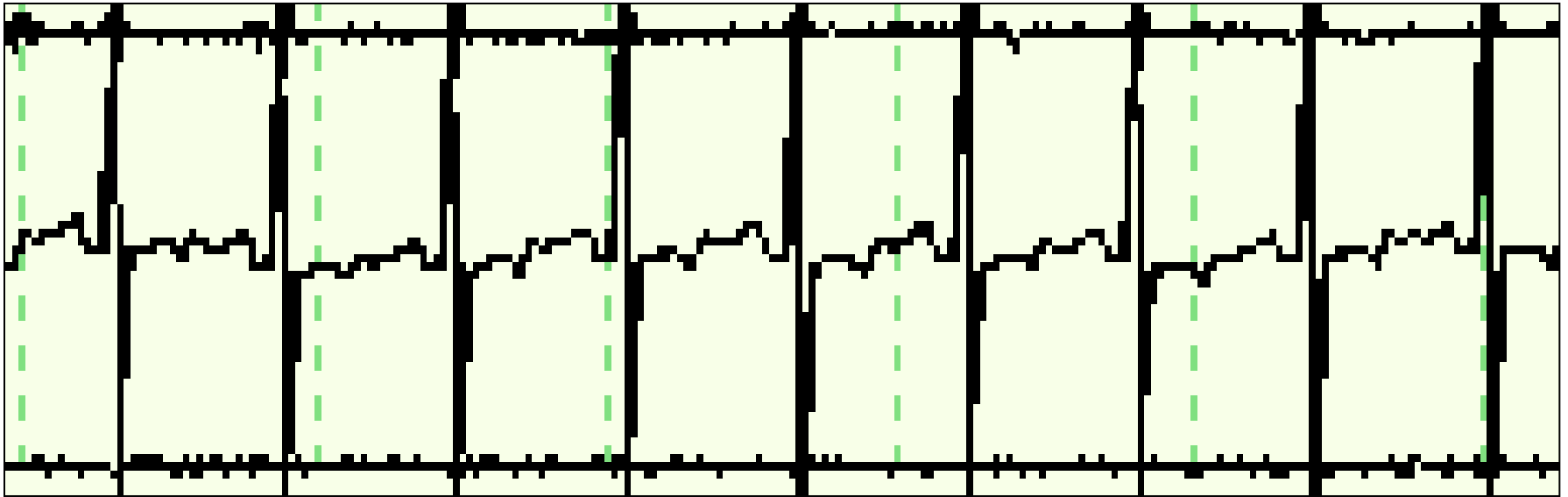
Atrial Fibrillation

- Possible causes
 - Hypertension
 - Heart disease
 - Wolff-Parkinson-White, valvular disease, hypertrophic cardiomyopathy
 - Sleep apnea
- Action
 - Monitor closely. In most cases, no action is needed
 - If symptomatic, notify sleep physician on call
 - Ask about dizziness, lightheadedness, chest pain, shortness of breath

Case #3. 24 Year Old Body Builder; 30 Second Window



5 Second Window



9 Beats in 5 Seconds = 108 Beats Per Minute

Identify the ECG – Case #3

- A. Atrial fibrillation
- B. Sinus tachycardia
- C. Ventricular tachycardia
- D. Wenckebach rhythm



Scoring Cardiac Events

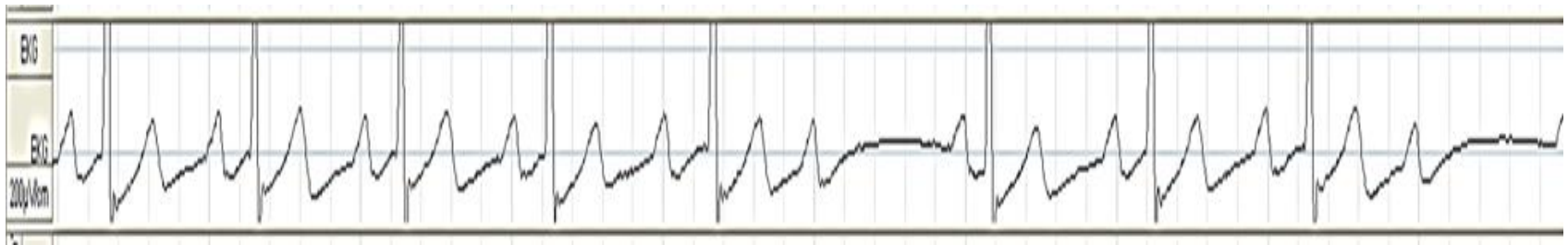
1. Score sinus tachycardia during sleep for a sustained sinus heart rate of greater than 90 beats per minute for adults.

Sinus Tachycardia

- Rhythm: Regular
 - P wave before each QRS, identical
 - QRS narrow: Duration < 0.12 seconds
- Possible causes
 - Stimulants
 - Anxiety
 - Heart attack
 - Hyperthyroidism
- Action
 - Monitor closely. In most cases, no action is needed
 - If symptomatic, notify sleep physician on call
 - Ask about dizziness, lightheadedness, chest pain, shortness of breath



Case #4: 24 Year Old Female Professional Tennis Player

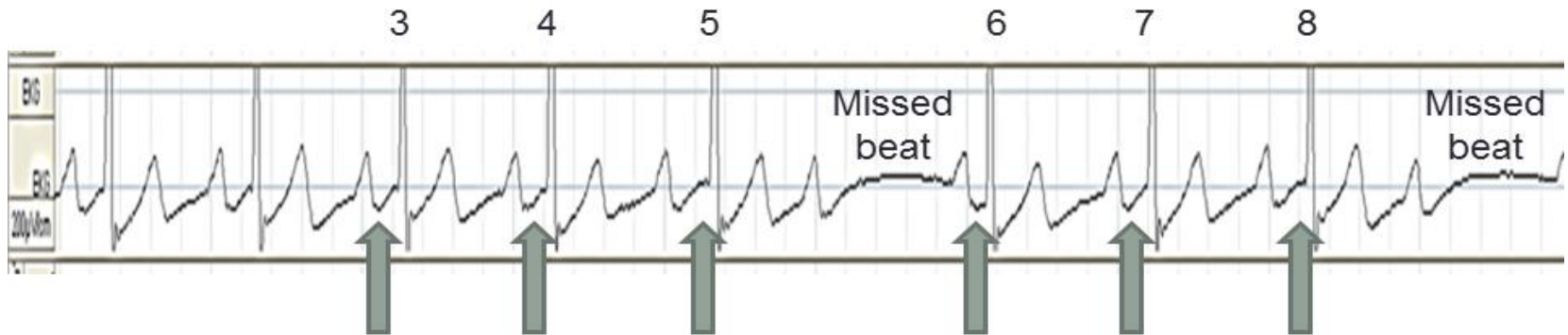


1 sec

Identify the ECG – Case #4

- A. Atrial fibrillation
- B. Sinus tachycardia
- C. Ventricular tachycardia
- D. Wenckebach rhythm

Wenckebach Type I



From the algorithm:

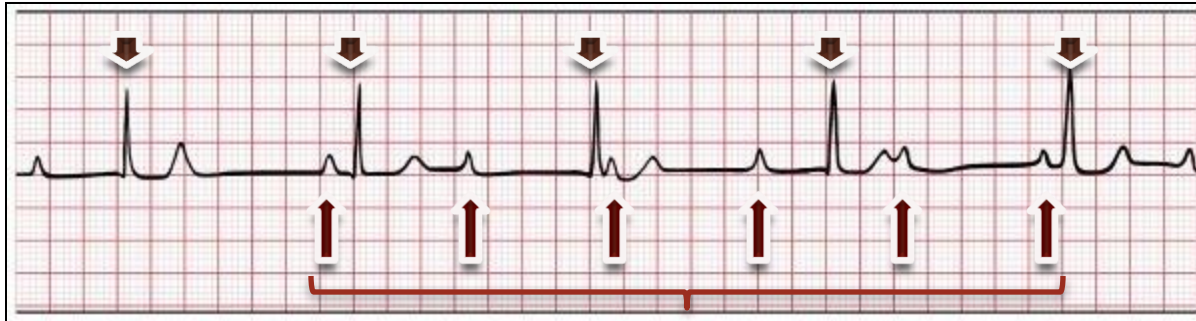
1. P waves are present and all look the same
2. QRS waves present and all look the same
3. PR interval > 0.20 sec
4. QRS interval < 0.12 sec
5. P:QRS $> 1:1$ (more P waves than QRS complexes)

Wenckebach Type I

- Possible causes
 - Beta blockers, calcium channel blockers, digoxin
 - Increased vagal tone (athletes)
 - Inferior MI
 - Myocarditis
- Action
 - Monitor closely. In most cases, no action is needed
 - If symptomatic, notify sleep physician on call
 - Ask about dizziness, lightheadedness, chest pain, shortness of breath

3rd Degree AV Block

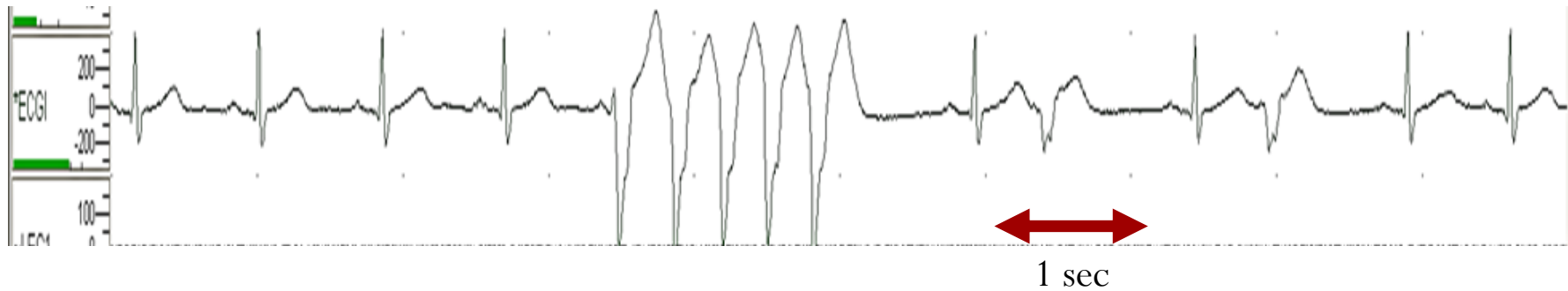
3rd Degree AV Block



- AV dissociation
- Regular R-R intervals
- Regular P-P intervals
- P-R intervals inconsistent

None of the P waves are conducted to the ventricles
The only heart contractions occur as a result of
ventricular escape rhythms
The patient is at risk for ventricular standstill and
sudden death

Case #5: 70 Year Old Man with History of Several Myocardial Infarctions



Identify the ECG – Case #5

- A. Atrial fibrillation
- B. Sinus tachycardia
- C. Ventricular tachycardia
- D. Wenckebach rhythm

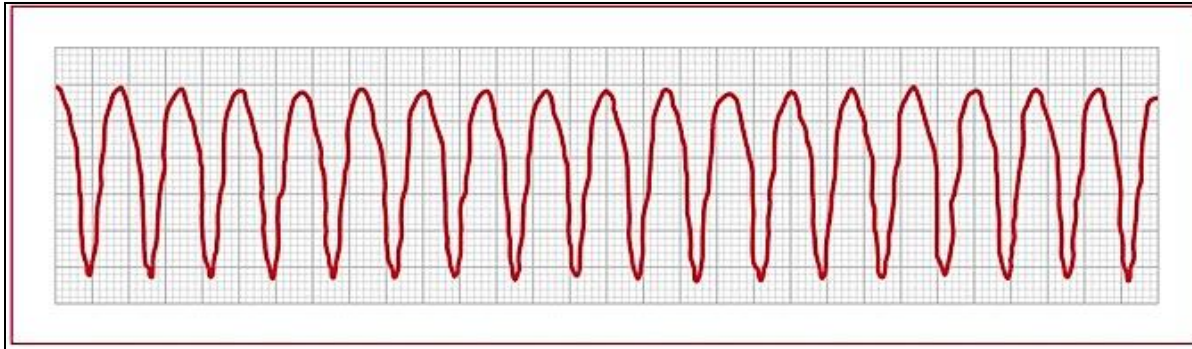


Ventricular Tachycardia

- There are no P waves and there are 5 consecutive beats with wide bizarre QRS complex at a rate of about 150 beats per minute. This is ventricular tachycardia, classified as wide complex tachycardia according to AASM guidelines.
- *From the AASM Manual:* Score wide complex tachycardia for a rhythm lasting a minimum of 3 consecutive beats at a rate greater than 100 per minute with QRS duration of greater than or equal to 120 msec.

Sustained Ventricular Tachycardia

Ventricular Tachycardia

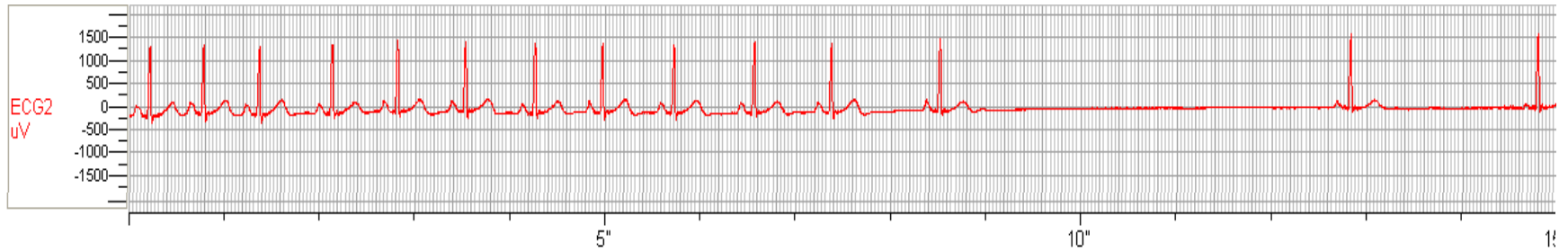


- ≥ 3 consecutive PVCs
- Rate > 100 /min
- Wide QRS
- Absent P waves
- Typically \downarrow in sleep
- Increased risk with OSA

**Ventricular tachycardia/fibrillation for
10 seconds or more**

**Wake up patient
Call emergency dialing _____
Call Medical Director**

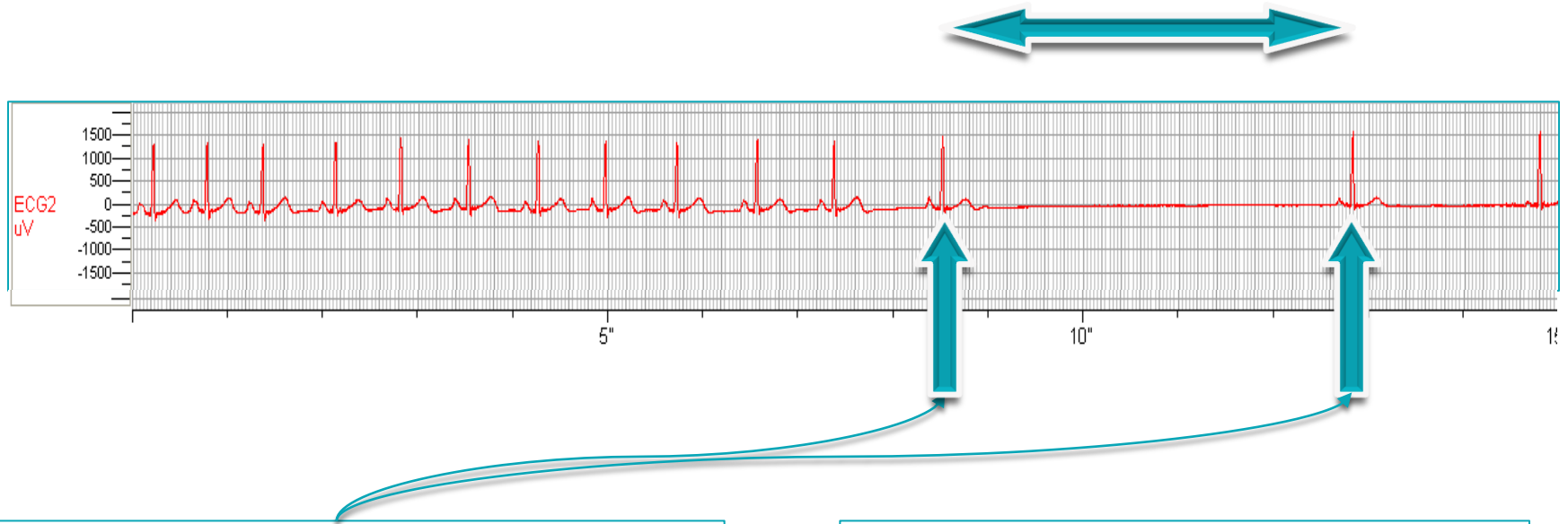
Case #6: 18 Year Old Man



Identify the ECG – Case #6

- A. Technical (equipment) failure
- B. Normal rhythm during obstructive apnea
- C. Asystole
- D. Bradycardia

Asystole (Sinus Pause)



This asystole lasts about 4.25 seconds. To be abnormal, the asystole must last at least 3 seconds.

Note that the ECG waveform does not change in this tracing. There are clear P waves followed by a QRS complex and a T wave for each heart beat.

Scoring Cardiac Events

3. Score asystole for cardiac pauses greater than 3 seconds for ages 6 years through adult.

Asystole of 10 seconds or more

**Check patient
Call emergency dialing _____
If applicable begin CPR**

Listen to the Patient



Emergency	Response
Chest pain, neck, jaw or arm pain	Assess patient, call Medical Director
Asystole of 10 seconds or more	Check patient Call emergency dialing _____ If applicable begin CPR
Ventricular tachycardia/fibrillation for 10 seconds or more	Wake up patient Call emergency dialing _____ Call Medical Director
≥6 PVC's in one minute (without history of PVC's)	Call Medical Director
Tachycardia 120 bpm or more over a minute or more, or not associated with periods of apnea	Wake up patient Call Medical Director
Bradycardia less than 40 bpm over a minute or longer, or not associated with periods of apnea	Wake up patient Call Medical Director
No ECG activity	Check patient Call emergency by dialing _____ If applicable begin CPR