Sinus Rhythms: Dysrhythmia Recognition and Management
Topics to be Discussed

- Criteria for sinus rhythms
- Clinical significance of the different sinus rhythms
- Treatment options
Sinus Rhythms

- **Possibilities**
  - Regular Sinus Rhythm
    - aka Normal Sinus Rhythm or Sinus Rhythm
  - Sinus Bradycardia
  - Sinus Tachycardia
  - Sinus Arrhythmia
  - Sinus Arrest
Sinus Rhythms

- Rhythm originates in the sinus node located in the wall of the right atrium just below the opening of the superior vena cava.
Sinus Rhythms

- Impulses conducted via intra-atrial pathways to the AV Node, His Bundle, and the Purkinje fibers.
Sinus Rhythms

- Expected ECG Rhythm
- Most do not result in altered physiology
- Sinus rhythm means that the pacemaker site is in the Sinoatrial (SA) node
- Characteristics of all sinus rhythms are similar, but may have different appearance
Sinus Rhythms
Sinus Rhythms
Regular Sinus Rhythm

**Characteristics**

- **Pacemaker site:** SA node
- **Rate:** 60-100 bpm
- **P waves:** are upright in lead II, all look alike
- **PR interval:** *generally* constant; 0.12 - 0.20 seconds
- **R-R interval:** *usually* regular
- **QRS complexes:** *usually* normal appearing and < 0.12 seconds, may be wide
- **P to QRS Relationship:** one P wave precedes each QRS complex
Analyze the Rhythm
Regular Sinus Rhythm

- **Pathophysiology**
  - None specific to the ECG rhythm itself
  - Normal and expected ECG rhythm

- **Management**
  - Treat the patient!
Sinus Rhythm
Sinus Bradycardia

- **Characteristics**
  - Same as RSR with ONE exception
  - **Rate:** < 60 bpm
Sinus Bradycardia
Analyze the Rhythm
Sinus Bradycardia

**Pathophysiology**

- Generally a result of some other cause
  - Excessive parasympathetic tone on SA node
  - Decrease in sympathetic tone on SA node (blockade)
  - Administration of calcium channel blockers
  - Digitalis toxicity
  - Disease of the SA node (sick sinus syndrome)
  - Acute inferior MI
  - Hypothyroidism
  - Hypothermia
  - Hypoxia (later)
  - Physical conditioning
Sinus Bradycardia

- **Symptomatic Presentation**
  - Variable
  - Severe presentation may result in
    - Dizziness, lightheadedness, altered mental status, or syncope
    - SOB
    - CP
    - Hypotension/Shock
    - Pulmonary congestion
    - Acute MI
Sinus Bradycardia

Management

First Steps after ABCDs
- Symptomatic or Asymptomatic
- If symptomatic, then Stable or Unstable
  - Altered mental status
  - Severe respiratory difficulty
  - Shock/Hypoperfusion

Attempt to Identify the Cause
- Implement Cause-Specific treatments, if applicable
Asymptomatic Bradycardia

- Primary ABCD - Assess and Treat Initially
- Secondary ABCD - Reassess and Further Tx
  - IV/O₂/ECG Monitor/12 lead ECG
  - Differential Diagnosis
  - Treat the cause
- IF 2° or 3° AVB, then
  - Place TCP in standby mode
Symptomatic Bradycardia

- Primary ABCD - Assess and Treat Initially
- Secondary ABCD - Reassess and Further Tx
  - IV/O₂/ECG Monitor/12 lead ECG
  - Differential Diagnosis
    - Cause specific treatment, if applicable
  - Atropine 0.5 mg IV q 3-5 min, max 0.04 mg/kg
  - TCP
  - Dopamine 5 – 20 mcg/kg/min
  - Epinephrine 2-10 mcg/min
Sinus Bradycardia

What cause-specific treatments can you think of when Sinus Brady is caused by:
- Excessive parasympathetic tone on SA node?
- Decrease in sympathetic tone on SA node?
- Administration of calcium channel blockers?
- Digitalis toxicity?
- Disease of the SA node?
- Acute inferior MI?
- Hypothyroidism? Hypothermia? Hypoxia?
What is the difference between absolute and relative bradycardia?
Sinus Tachycardia

- **Characteristics**
  - Essentially same as for RSR with ONE exception
    - HR < 100 bpm
  - At very fast rates, difficult to see P waves
  - In adults, ST is generally limited to a rate of 150-160 bpm
Analyze the Rhythm
Sinus Tachycardia

- **Pathophysiology**
  - Generally a result of some other cause
    - Intake of stimulants
    - Increase circulating catecholamines and sympathetic tone
    - Anticholinergic or sympathomimetic drug
    - Hypoxia (CHF, PE, etc)
    - Myocardial ischemia
    - Fever
    - Thyrotoxicosis
    - Anemia/Hypovolemia/Hypotension/Shock
Sinus Tachycardia

- Symptomatic Presentation
  - Variable
  - May result in
    - Worsening hemodynamic instability
    - Dysrhythmias
    - Worsening myocardial ischemia
Sinus Tachycardia
Sinus Tachycardia

- **Management**
  - First Steps after ABCDs
  - Attempt to Identify the Cause
    - Treat the Underlying Cause!!!
  - Occasionally requires treatment
    - Beta blockers
    - Calcium channel blockers
Sinus Arrhythmia

**Characteristics**

- Same as RSR except for:
  - **Rate**: 60-100 bpm, may be slightly faster or slower
  - **R-R interval**: *irregular*
Analyze the Rhythm
Sinus Arrhythmia

**Pathophysiology**
- Most often related to ventilations
  - decreased vagal tone during inspiration causing HR to increase
  - increased vagal tone during expiration causing HR to decrease
- Common in children, young adults and physically conditioned
- May be other causes
  - heart disease
  - drug related
Sinus Arrhythmia

- **Presentation**
  - Usually no clinical significance
  - Does not require treatment
  - Symptoms may occur if sinus arrhythmia results in bradycardia

- **Management**
  - Treat the patient!
Sinus Arrhythmia
Sinus Arrest

**Characteristics**

- May simply be an addition to an underlying rhythm
  - e.g. RSR with episodes of sinus arrest
- Same as RSR with these exceptions:
  - **Rate**: Usually 60-100 bpm but may be less than 60 bpm
  - **Rhythm**: irregular
  - **R-R interval**: not all equal when sinus arrest occurs
- Appears as a sinus rhythm with unexpected episodes of no conduction
  - No P wave; QRS may only result from ectopic complex
Analyze the Rhythm
Sinus Arrest

- **Pathophysiology**
  - Depression in the automaticity of the SA node, or
  - Block in the conduction pathways from SA node into atria
  - Often precipitated by:
    - Increase in vagal tone
    - Hypoxia
    - Hyperkalemia
    - Excessive drugs: digitalis, beta blockers, quinidine
    - SA Node ischemia or Sick Sinus Syndrome
Sinus Arrest

- **Presentation**
  - Transient episodes may have no clinical manifestation or clinical significance
  - Alternative pacemaker site should take over to prevent extreme bradycardia
  - Symptoms most likely if episodes progress to prolonged sinus arrest resulting in bradycardia
Sinus Arrest

**Management**

- Treat like Bradycardia
  - Atropine 0.5 mg IV fast push and repeat every 5 minutes to a maximum dose of 3 mg.
  - Transcutaneous pacing
  - Dopamine 2 – 20 mcg/kg/min
  - Epinephrine 2 – 10 mcg/min
Sinus Rhythms

- The expected rhythm in most patients
- Identify causes and treat the cause if the patient is symptomatic.
- Bradycardias can lead to decreased cardiac output and cerebral perfusion.
- Treat sinus arrest like bradycardia.
Questions?