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Tachycardias; Bradycardias

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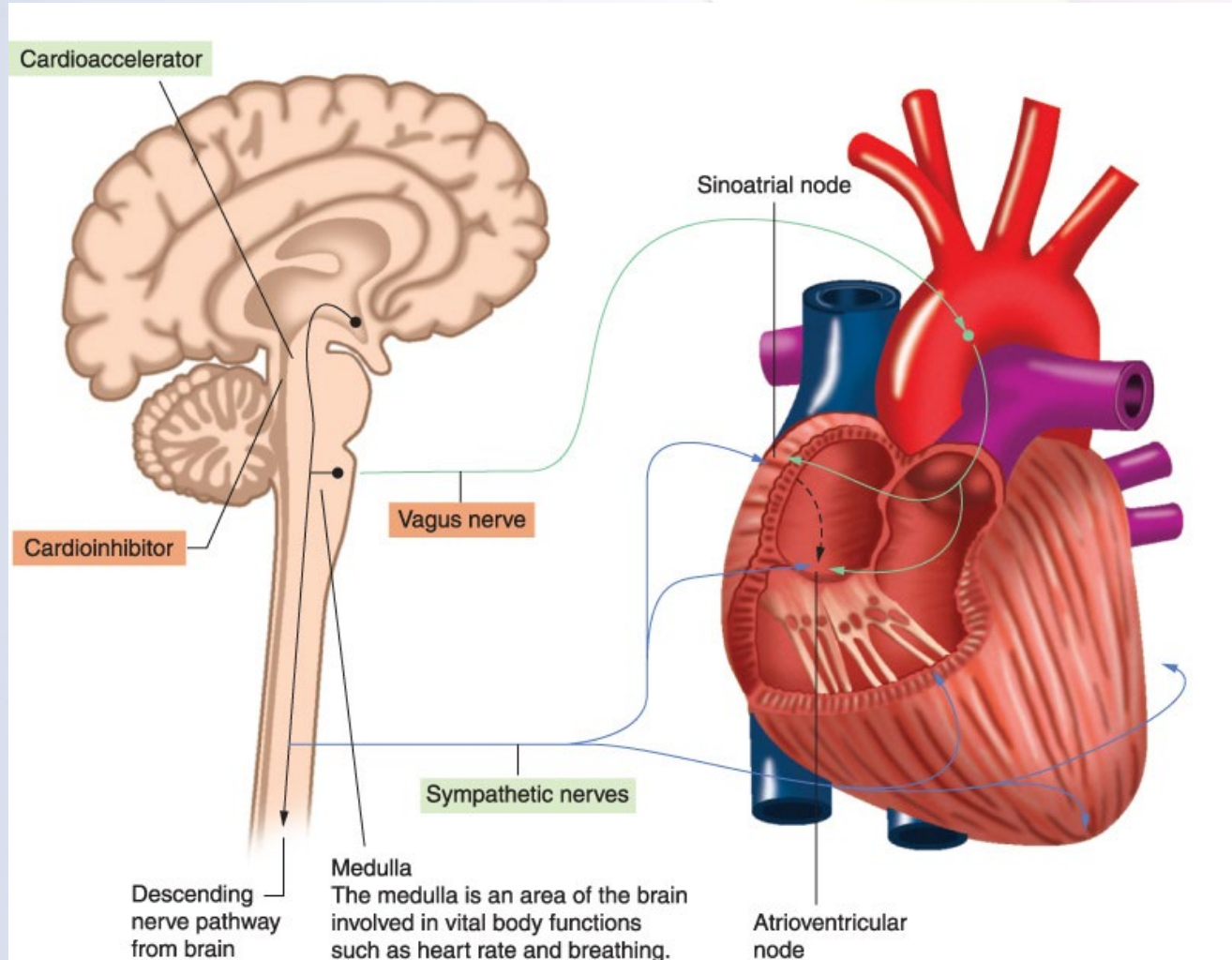
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Autonomic Nervous System

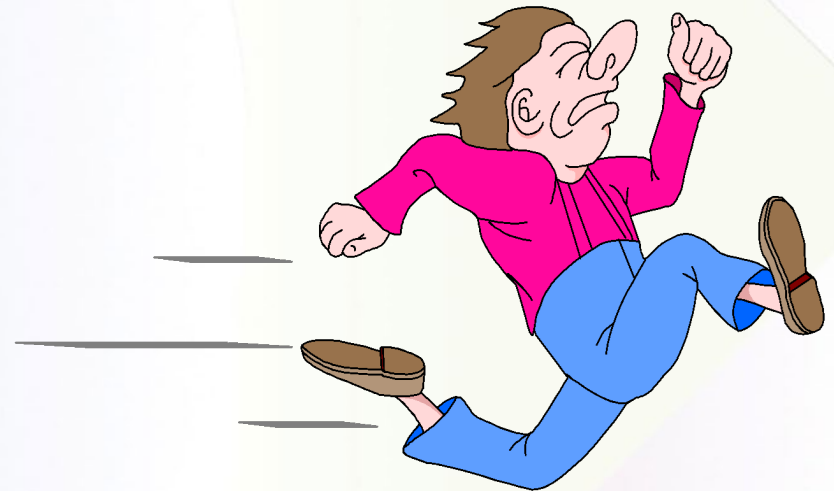
- Helps regulate rate and strength of myocardial contractions
 - Divided into sympathetic and parasympathetic nervous systems

Autonomic Nervous System

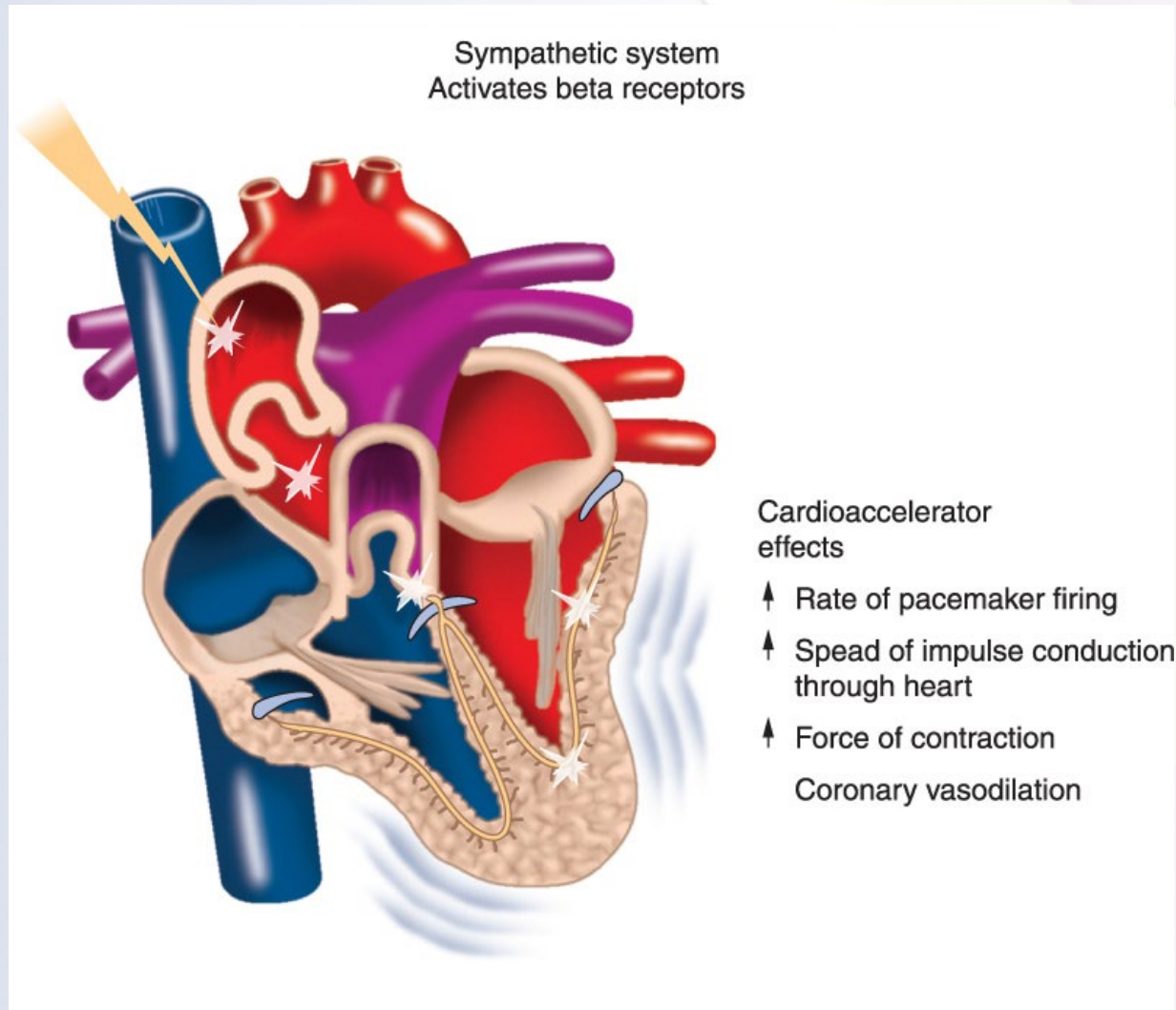


Sympathetic Stimulation

- Nerves arising in thoracic and lumbar ganglia
- Innervate both atria and ventricles
- Receptor sites:
 - Alpha
 - Beta



Sympathetic Stimulation

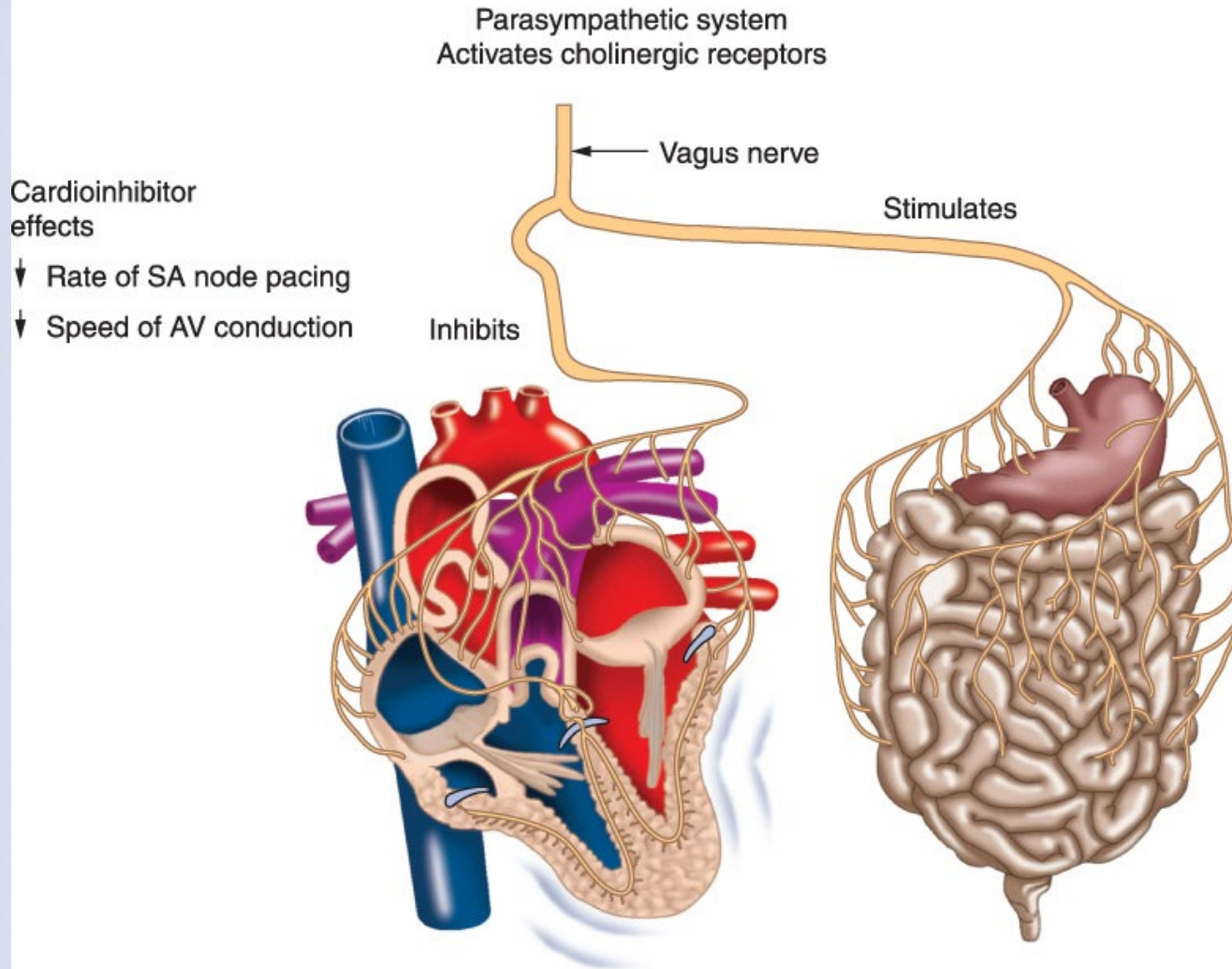


Parasympathetic Stimulation

- Vagus nerve
- Primarily innervates atria, but some fibers to ventricles
- Effect: slows heart rate and AV conduction
- Methods of manual stimulation:
Valsalva maneuver

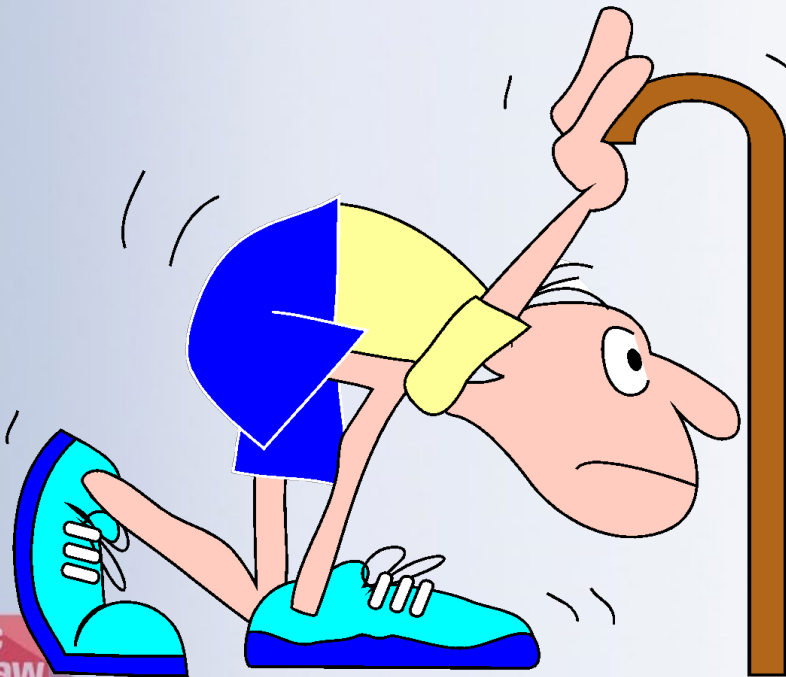


Parasympathetic Stimulation



Parasympathetic (cholinergic) control

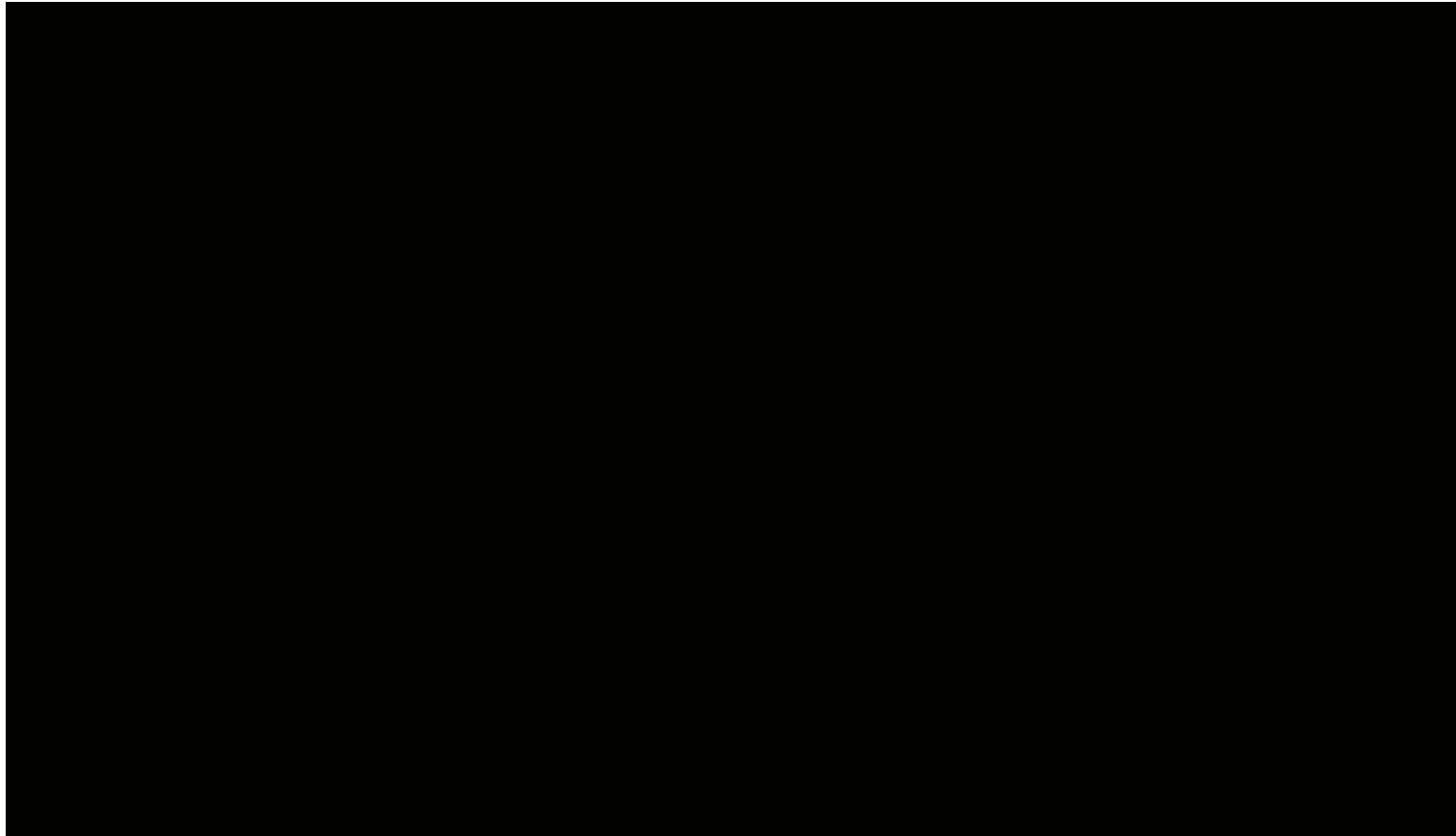
- Effects of parasympathetic (vagal) stimulation
 - Decreased firing rate of SA node,
 - decreased AV conduction,
 - little effect on ventricles



Propagation of the Action Potential

- All or nothing event
- Action potential travel from their point of origin in outward
- Cardiac Conduction system is USUALLY one way
- Horizontal Septum acts as an insulator

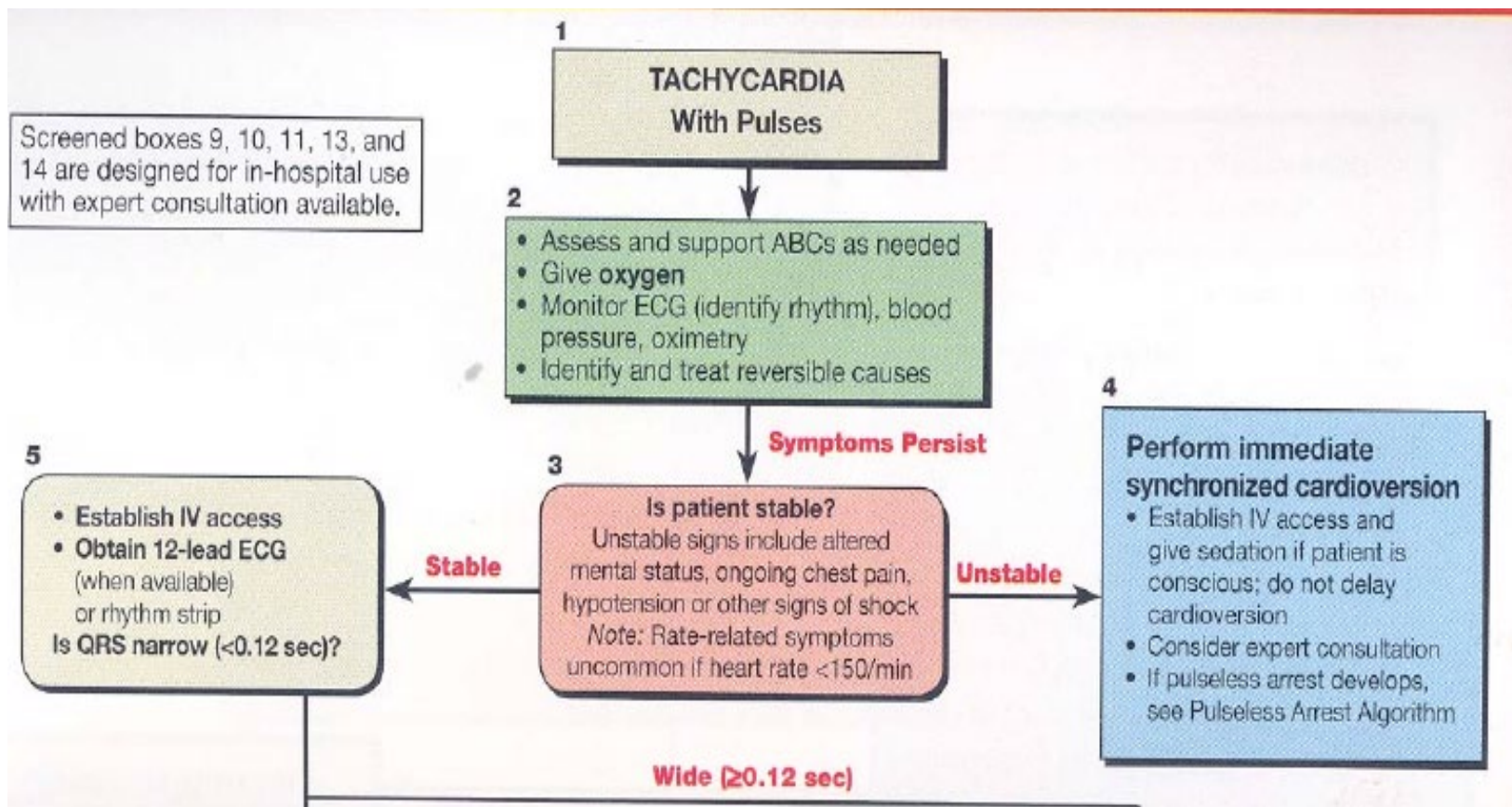
Synchronized Cardioversion



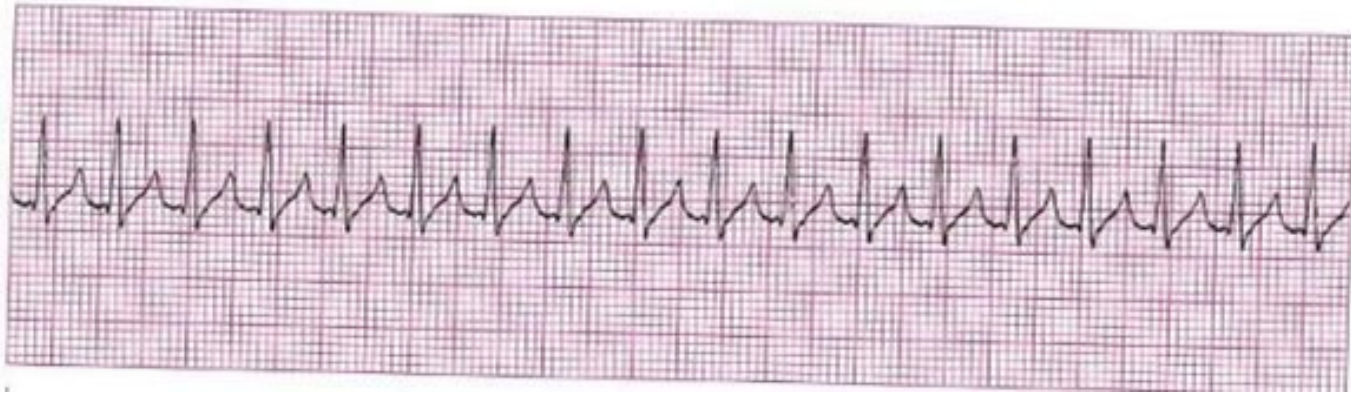
Indications for use of Cardioversion

- ☐ SVT or VT at a rate of greater than 150 bpm
- ☐ WITH significant signs and symptoms:
 - ⦿ Chest pain
 - ⦿ Hypotension
 - ⦿ Respiratory distress (SOA, pulmonary edema)
 - ⦿ Syncopal episode, cyanosis, diaphoresis

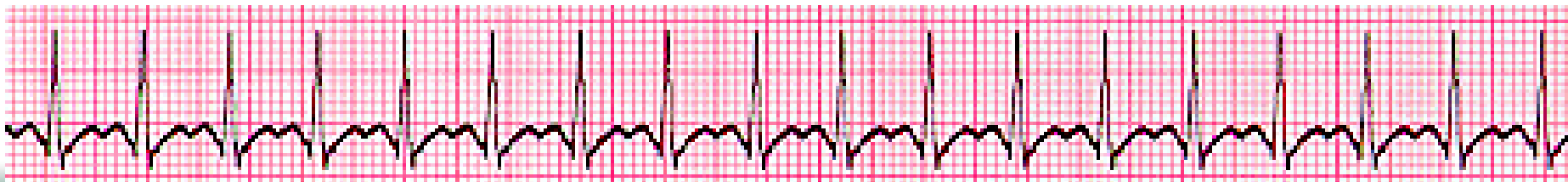
Cardioversion



PSVT



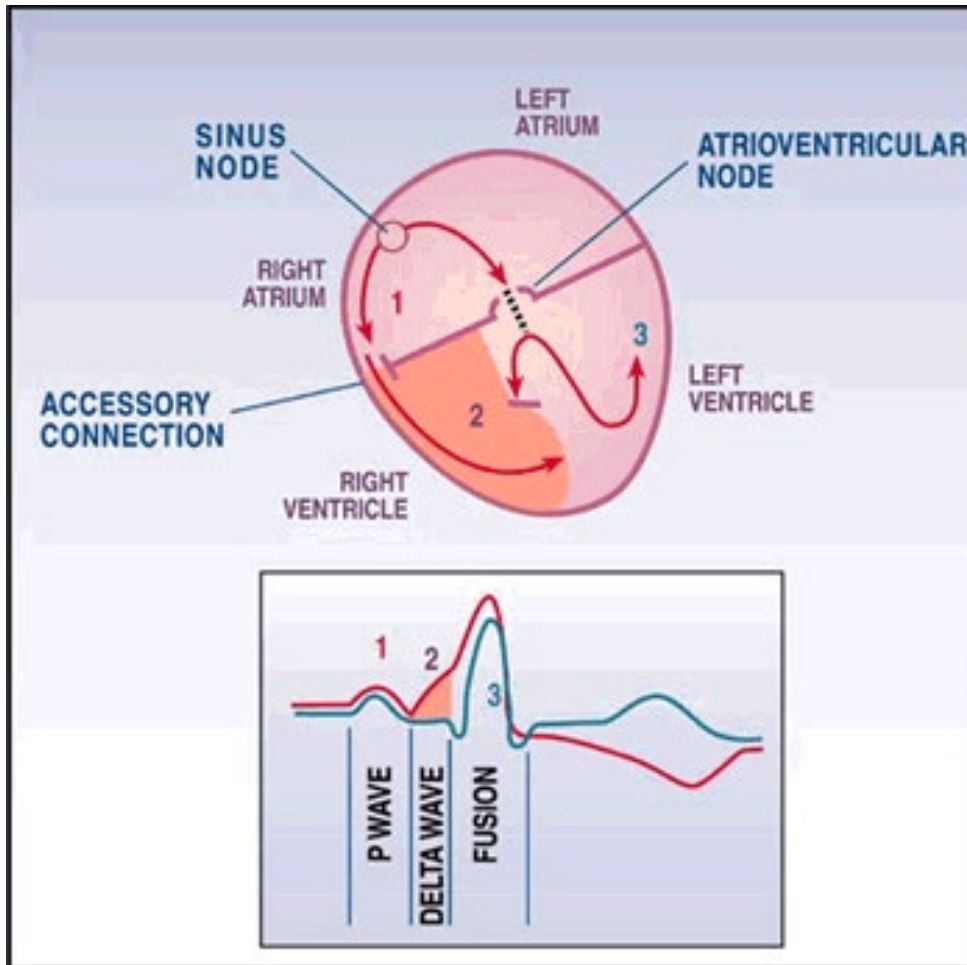
- ☐ May be caused by reentry, usually at the AV node, or by increased automaticity of a single atrial focus.



PSVT

- ☐ Sino-Atrial Reentrant Tachycardia - **A rare form of PSVT where the reentrant circuit is between the sinus node and the right atria.**
- ☐ Atrial Tachycardia – **Since the arrhythmia does not involve the AV node, vagal maneuvers and adenosine usually are ineffective.**

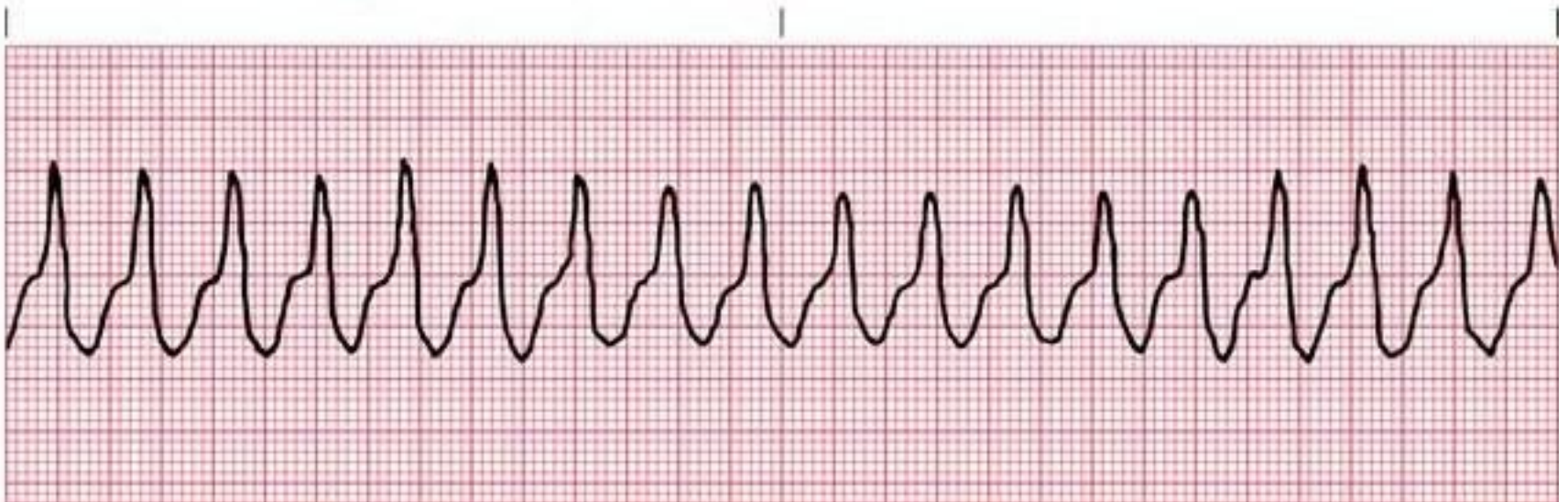
Atrioventricular Reentrant Tachycardia



- Rarely, the antegrade limb uses the bypass track and the retrograde limb uses the AV junction.
- The PSVT then resembles a wide QRS tachycardia and must be differentiated from ventricular tachycardia.

Ventricular Tachycardia

- ☐ Wide complex
- ☐ Can deteriorate to V-Fib



Interrupting the Reentry Pathway

- ☐ **Vagal maneuvers increase parasympathetic tone and slow conduction through the AV node.**
- ☐ **Adenosine slows conduction through the AV node.**
- ☐ **Neither usually work with V-Tach**

Vagal Maneuvers

☐ Indications – Hemodynamically stable SVT

☐ Precautions:

- ⦿ Must establish ECG monitoring and IV prior to vagal maneuvers.
- ⦿ Atropine, lidocaine and airway equipment should be readily available

Vagal Maneuvers

☐ Valsalva

- ⦿ Place patient seated or semi-seated with head down.
- ⦿ Instruct patient to take a deep breath and “bear down” as if for bowel movement.

☐ Ice pack

- ⦿ Contraindicated in ischemic heart disease
- ⦿ Place ice pack on patient’s anterior neck

☐ Children

- ⦿ Place washcloth soaked in ice water across patient’s face, about nostril level.



Synchronized Cardioversion

- ☐ Used to reset the heart and convert tachycardias when the patient is symptomatic.
 - V-tach with a pulse
 - PSVT

Synchronized Cardioversion

- ☐ Cardioversion terminates reentry loops; defibrillation – either atrial or ventricular – terminates fibrillation by depolarizing the entire fibrillating myocardium.
- ☐ The most frequent cause of sustained ventricular tachycardia is reentry along the margin of old infarcted myocardium.

Synchronized Cardioversion

- ☐ Using **unsynchronized** shocks to convert tachycardias may produce V-fib if the shock occurs during repolarization (T-wave).
- ☐ A defibrillator in “sync” mode “**synchronized shocks**” delivers the shock a few milliseconds after the peak of the R-wave.

Synchronized Cardioversion

Indications:

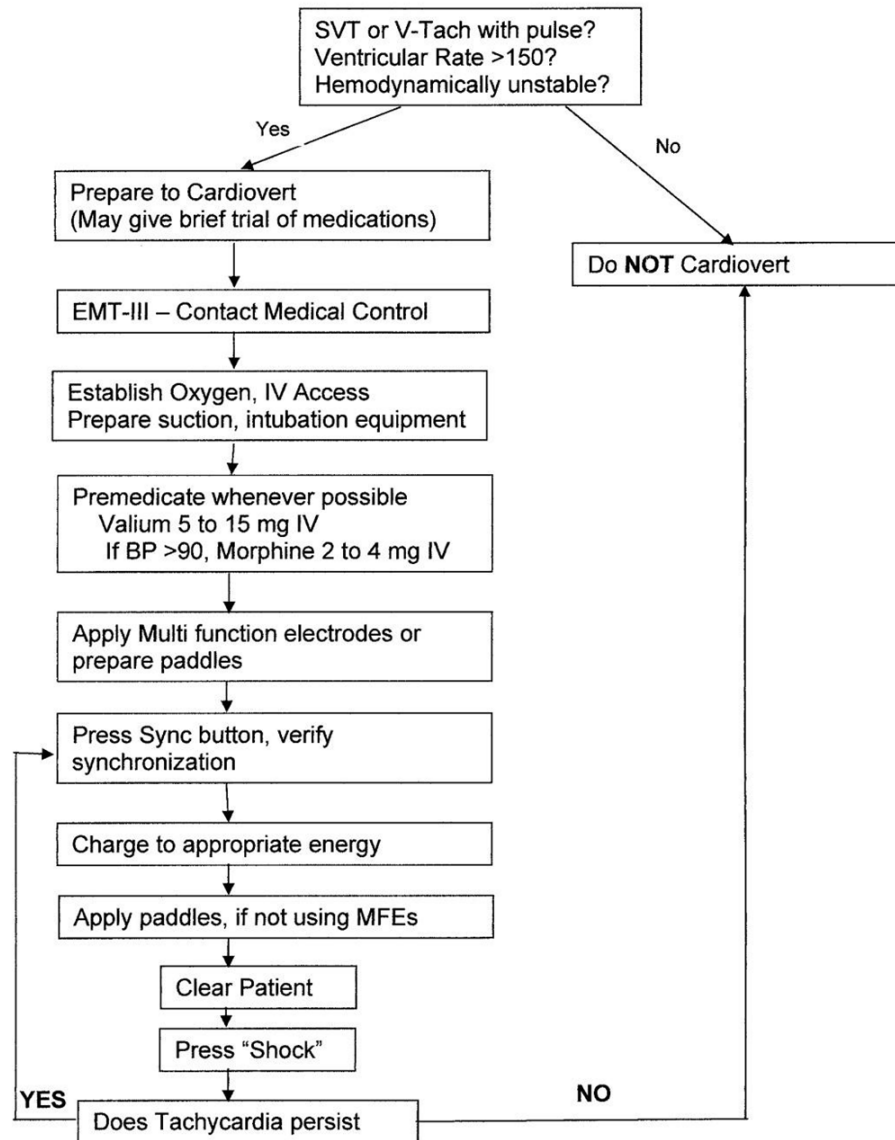
- ⦿ Hemodynamically unstable SVT or V-tach with a pulse.
 - Chest pain
 - Shortness of breath
 - Altered LOC
 - Low BP
 - Shock
 - CHF
 - Pulmonary congestion
- ⦿ EMT-III must **contact medical control for permission.**

Synchronized Cardioversion

☐ Contraindications and Precautions

- ⦿ Immediate cardioversion is seldom required for pulse rates less than 150 BPM
- ⦿ Treat **pulseless V-tach** like V-fib
- ⦿ A-fib>48 hours: risk of clots and stroke

SYNCHRONIZED CARDIOVERSION



Synchronized Cardioversion

Complications:

- ☐ Pain from delivery of the shock.
- ☐ Skin burns due to inadequate contact between paddles and skin.
- ☐ Rescuer defibrillation due to contact with stretcher or patient.

Notes:

- ☐ Sedation of conscious patients with an amnesic such as Valium or Versed is strongly recommended. If the patient's blood pressure is adequate, use of morphine is also recommended.

Synchronized Cardioversion

☐ Complications (cont'd):

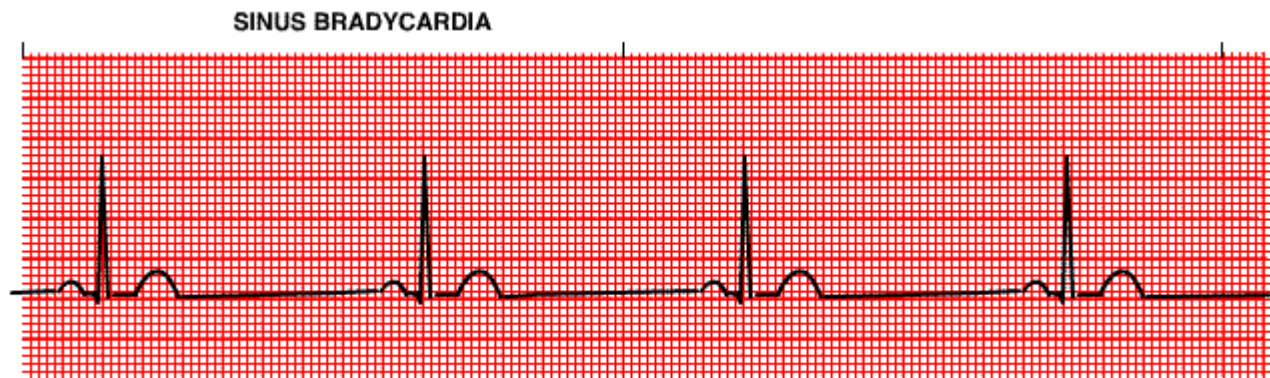
- ⦿ Rescuer defibrillation due to contact with stretcher or patient.
- ⦿ Skin burns due to inadequate contact between paddles and skin.

Synchronized Cardioversion





Transcutaneous Pacing



Transcutaneous Pacing

- ☐ Delivers a shock causing depolarization and contraction of the myocardium.
- ☐ No risk of electrical injury to providers.
Delivers less than 1/1000 the energy used in defibrillation.

Transcutaneous Pacing

Indications

- ① Symptomatic bradycardias, including AV block
 - Use transcutaneous pacing only for bradycardias not responsive to oxygen, ventilation and atropine.
- ① Significant signs and symptoms include:
 - BP < 80 systolic
 - Chest pain
 - Altered LOC
 - Pulmonary edema

Transcutaneous Pacing

Indications

- **Symptomatic Bradycardia unresolved by atropine**
- **Symptomatic Mobitz II and third-degree blocks.**



Transcutaneous Pacing

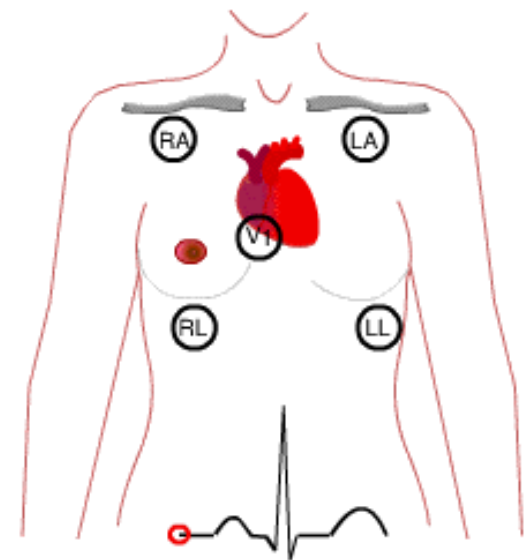
Contraindications

- Bradycardia due to severe hypothermia
 - May be physiologic
 - Increased risk of refractory V-fib
- Most bradycardia in children results from hypoxia or hypoventilation and responds to adequate airway intervention.

Transcutaneous Pacing

Procedure:

1. Consider valium.
2. Apply defib electrodes, generally (-) left anterior, (+) left posterior.
3. Apply four-lead electrodes.
4. Follow with application of 12-lead ECG



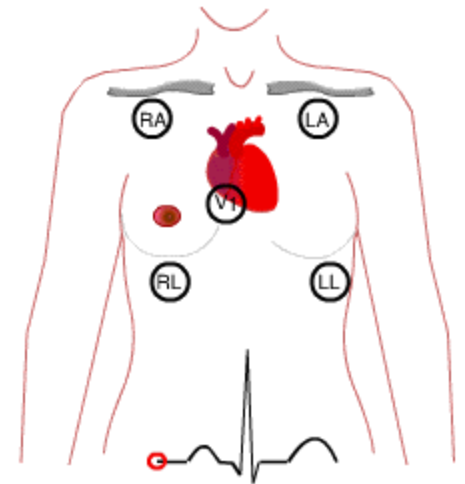
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Five Lead Placement

Transcutaneous Pacing

Procedure:.

4. Turn Zoll to “Pacer.”
5. Zoll E Series presets: Energy=30 mAmps, Rate=70 BPM
6. Zoll M Series presets: Energy=0 mAmps, Rate=60 BPM



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Five Lead Placement

Transcutaneous Pacing

Procedure:

Slowly increase current to 40 mAmps, check for capture.

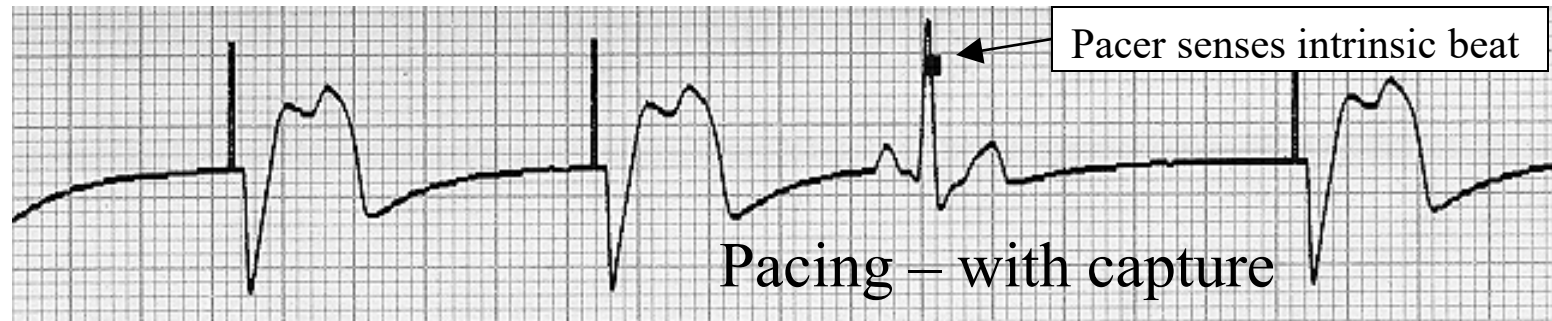
Continue increasing mAmps until capture reached.



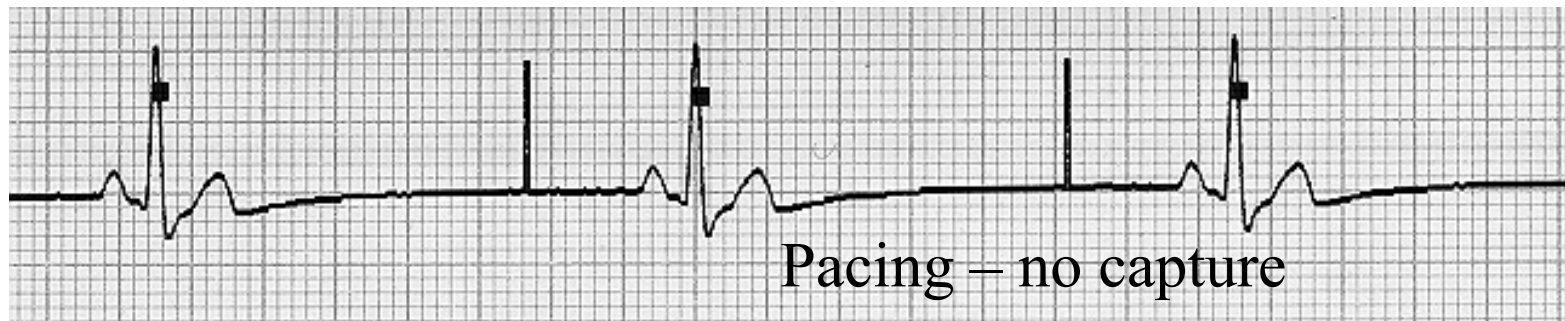
Bradycardia

Transcutaneous Pacing

A wide QRS (generally) and a QRS after every pacer spike signify capture.



If no capture, increase current 10 mAmps every 10-15 seconds until capture or 200 mAmps.



Transcutaneous Pacing

- ☐ Set pacer to the lowest output required to maintain capture, usually 2-10 mAmps above the capture threshold.
- ☐ Verify pulse and check blood pressure.
 - Check femoral pulse.
 - Muscle twitch due to pacing may be mistaken for carotid or left radial pulse.
- ☐ When pacing in asynchronous mode or without 3-lead ECG tracing, the Zoll will pace at the indicated rate regardless of intrinsic beats.

Transcutaneous Pacing

Adverse Effects:

- ☐ Muscle tremors
- ☐ Diaphragmatic stimulation
- ☐ VF and VT are rare complications. Treat according to protocols.

Notes:

- ☐ CPR is safe during pacing. You may feel a mild shock if you make direct contact with defib pads.

Transcutaneous Pacing



QUESTIONS??

