Northwest Community Healthcare
Paramedic Program

SINUS RHYTHM AND DYSRHYTHMIAS

Connie J. Mattera, M.S., R.N., EMT-P

Reading assignments:
SOP: Bradycardia with a pulse
Narrow QRS Complex Tachycardia with a pulse and HR > 100
Procedure Manual: Transcutaneous Pacing

Education standard:
Safely and effectively perform all psychomotor skills within the National EMS Scope of Practice Model AND state Scope of Practice at this level: • ECG interpretation

OBJECTIVES:

Upon completion of the reading assignments, class, and homework questions, reviewing the SOPs, and working with their small group, each participant will independently do the following with at least an 80% degree of accuracy and no critical errors:

1. Describe the possible etiologies and clinical significance of the following rhythms:
   a) Sinus rhythm
   b) Sinus tachycardia
   c) Sinus bradycardia
   d) Sinus dysrhythmia
   e) Sinus block/arrest
2. Identify on a 6-second strip the following rhythms:
   a) Sinus rhythm
   b) Sinus tachycardia
   c) Sinus bradycardia
   d) Sinus dysrhythmia
   e) Sinus block/arrest
3. Systematically evaluate each rhythm for the following criteria:
   a) Rate,
   b) Rhythm: Regular/irregular,
   c) Presence/absence/morphology of P waves,
   d) R-R Interval, P-P Interval,
   e) P-QRS relationship, and
   f) QRS duration.
   g) Pacemaker origin
4. Correlate the cardiac rhythm with patient assessment findings to determine the emergency treatment for each rhythm according to NWC EMSS SOPs.
5. Discuss the classification, action, prehospital indications, contraindications, dose and route, and side effects of the following:
   a) Atropine
   b) Norepinephrine, dopamine
   c) Glucagon
6. Describe the indications, critical steps, and monitoring priorities for transcutaneous pacing.

NCH Paramedic Program

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I. Definitions as a point of review

A. Tachycardia: Rate greater than 100

B. Bradycardia Rate less than the minimum for that pacemaker site

C. Intrinsic firing rate: normal rate range for a particular pacemaker site

D. Isoelectric line: Baseline where no electrical activity is present. Measured during the T-P interval.

E. Accelerated rhythm: A rhythm that fires above it's normal intrinsic rate, but less than 100

F. Ectopic beat: A beat originating outside the normal pacemaker's control

G. Pacemaker: The location responsible for originating the rhythm

H. Depolarization: Electrical firing of the cells of the heart (caused by ions crossing membrane)

I. Repolarization: The time during which the cells recharge (reset) after depolarization

J. Refractory period: The time during repolarization when cells rearm and may or may not be able to accept another stimulus (depolarize)

K. R – R Interval: The distance between the peaks (apex) of the ventricular depolarization waves (QRS) during each cardiac cycle. Measured for regularity or irregularity.

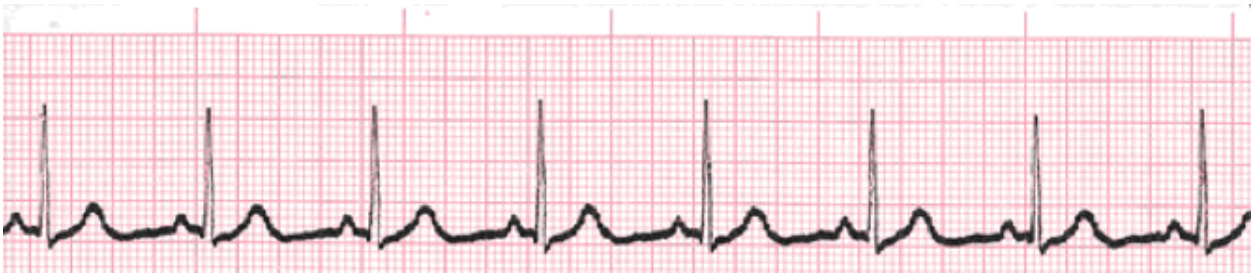
L. P – P Interval: The distance between the peaks of the atrial depolarization waves (P wave) during each cardiac cycle. Also measured for regularity or irregularity.

M. PR Interval: The distance between the beginning of atrial depolarization (P wave) to the beginning of ventricular depolarization (first deflection of QRS)

II. Rhythm interpretation tips

A. Use a systematic approach - go through all the steps – no shortcuts!
B. Compare with the rules of the rhythms (characteristics list)
C. Interpret the dysrhythmia
D. PRACTICE – PRACTICE - PRACTICE

III. Normal sinus rhythm



A. Description: "Normal Rhythm"

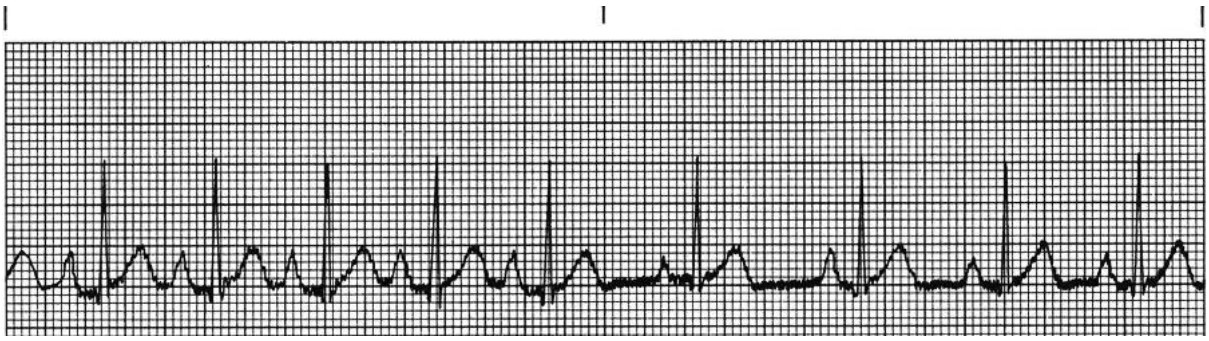
B. Characteristics list

1. Rate: 60 - 100 per minute
2. Rhythm: Regular
3. P waves
   a. Normal and upright
   b. One to one relationship with each QRS complex
4. P-R interval: 0.12 - 0.20 seconds and constant
5. QRS complex: 0.04 - 0.10 seconds

C. Clinical significance: Assess the patient

D. Treatment: Based on clinical presentation

IV. **Sinus arrhythmia or dysrhythmia**



A. **Description**: SA node discharges impulses at an irregular rate. This causes a phasic or cyclical variation of R-R interval greater than 0.16 seconds.

B. **Etiology**

1. Respiratory cycle related due to changes in intrathoracic pressure; normal phenomenon; especially in children
2. Non-respiratory influenced; normal phenomenon
3. Enhanced vagal tone

C. **Characteristics list**

1. Rate: Usually 60-100 per minute (varies)

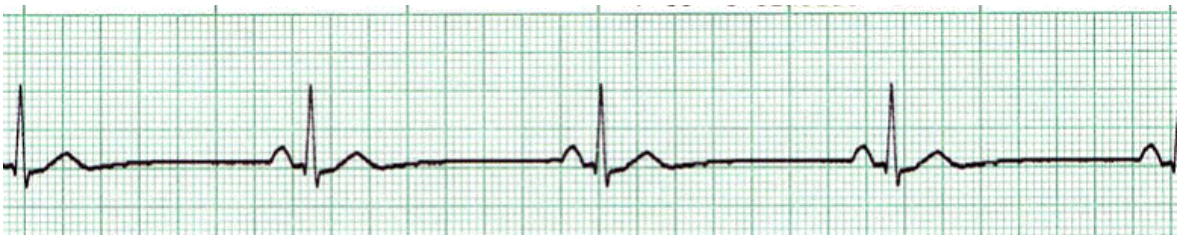
   Respiratory etiology: rate gradually increases with inspiration, decreases with expiration – may become bradycardic at times.

2. Rhythm: Regularly (cyclically) irregular
3. P waves (pacemaker site SA node)
   a. Normal and upright
   b. One to one relationship with each QRS
4. P-R interval: 0.12 - 0.20 seconds and constant
5. QRS complex: 0.04 - 0.10 seconds

D. **Clinical significance**: Normal phenomenon particularly in very young, very old and very healthy

E. Treatment: IMC

V. **Sinus bradycardia**



A. **Incidence**

1. Common dysrhythmia occurring during the early phases of AMI, particularly frequent in patients with inferior and posterior infarction involving the right coronary artery (that supplies blood to the SA node).
2. 25%-40% of patients with ACS have ECG evidence of SB within the first hour of the onset of symptoms. This declines to 15%-20% four hours after infarction commences.

B. **Etiology**

1. Any condition that causes **slowing of the SA node discharges**. This can include increased parasympathetic (vagal) and decreased sympathetic NS tone: carotid sinus hypersensitivity syndrome, sleep apnea syndrome, severe hypothermia, hypothyroidism, and increased intracranial pressure. This is probably protective during AMI as it decreases O_2 demand.
2. Activation of the Bezold-Jarisch reflex mediated by the vagus nerves and occurs during reperfusion, particularly of the RCA.
3. **Vasovagal reaction** causing vascular dilation is commonly seen with vomiting or pain or precipitated by sudden stress and may be intensified by severe pain or hypoxia.
4. Intrinsic sinus node disease
5. **Drug effects**: Beta blockers, calcium channel blockers, digitalis, quinidine
6. May be normal during sleep and in well-conditioned athletes

C. **Characteristics**

1. Rate: Less than 60 per minute (Usually between 40 & 60)
2. Rhythm: Regular
3. P waves
   a. Normal and upright
   b. One to one relationship with each QRS
4. P-R interval: 0.12 - 0.20 seconds and constant
5. QRS complex: 0.04 - 0.10 seconds

D. **Clinical significance**

1. May have none in a healthy athlete. Decreased HR may compromise cardiac output especially if less than 50 BPM.
   a. Hypotension; angina
   b. CNS symptoms: dizziness, lightheadedness, syncopal episode
2. This rhythm may precede more lethal rhythms or lead to atrial ectopic rhythms or beats or escape rhythms from the AV node or ventricles.

E. **Treatment – See Bradycardia with a Pulse SOP**

In all cases – **treat the patient, NOT the monitor**! Further ALS interventions are unnecessary unless patient is symptomatic (hypotensive, HF, angina, syncope or AMS).

1. Assess for rate, rhythm, pump, or volume problem; hypoperfusion and cardiorespiratory compromise. Correctly identity the presence & type of AV block. *Correct rate problems first unless VT/VF*.
2. **Assess/treat for possible underlying causes**: Hypoxemia, cardiac ischemia, OD, vasovagal episode, etc.
3. **IMC:** Support ABCs; determine need for advanced airway; O_2 if hypoxemic Anticipate need for pacing; apply pads while attempting vascular access
4. Obtain, review, and transmit 12-lead ECG per ACS SOP (don't delay therapy)
5. If possible ACS &alert; + gag reflex; stable: Treat ischemia (ASA)/pain (fentanyl) per ACS SOP
6. **Lower acuity: NONE to MILD cardiorespiratory compromise:** Alert, oriented, well perfused, SBP ≥ 90 (MAP ≥65)
   a. Ongoing assessment for hemodynamic and rhythm stability
   b. Place transcutaneous pacing (TCP) electrodes in anticipation of clinical deterioration in pts w/ acute ischemia or MI associated with severe sinus bradycardia, asymptomatic 2˚ AVB Mobitz type 2, asymptomatic 3˚ AVB; or new onset Bundle Branch Block (BBB) or bifascicular block with AMI

7. **Emergent to Critical: MODERATE to SEVERE cardiorespiratory compromise:** Instability related to slow rate: Acutely altered mental status, SBP < 90 (MAP <65), chest discomfort or pain, SOB, poor peripheral perfusion, weakness, fatigue, light headedness, dizziness and presyncope or syncope, pulmonary congestion, HF or pulmonary edema, escape beats, frequent PVC.

   a. **ATROPINE 0.5 mg rapid IVP/IO** unless contraindicated [AVB 2˚ Mobitz type 2 or 3˚ w/ wide QRS; transplanted hearts (lack vagal innervation] – See drug profile.

      Repeat **ATROPINE 0.5 mg rapid IVP/IO** q. 3-5 min to a max of 3 mg IVP if bradycardia with ↓ BP persists.

   b. **<u>If atropine ineffective or contraindicated</u>**

      NOREPINEPHRINE 8 mcg/min; maintain SBP ≥ 90 (MAP ≥65). See drug profile.

   c. **<u>If atropine & norepinephrine ineffective or contraindicated or no vascular access</u>**:

      Transcutaneous external cardiac PACING (TCP) per procedure manual and based on specific brand and model of monitor

      - Select starting rate of 60 BPM. May adjust rate up to 70 BPM based on clinical response.
      - Increase mA until **mechanical capture confirmed** (palpable femoral pulse) or a **maximum of 200 mA** used. Evaluate BP once mechanical capture is achieved.
      - If mechanical capture present: CONTINUE PACING ENROUTE; do not turn off
      - **Assess need for sedation / analgesia: :** If SBP ≥ 90 (MAP≥ 65):

        If agitated: **MIDAZOLAM** as below .If condition deteriorating and critical, omit sedation.

        MIDAZOLAM 2 mg increments slow IVP q. 2 min (0.2 mg/kg IN*)* up to 10 mg IVP/IN titrated to pt response. If IV unable and IN contraindicated: IM dose 5-10 mg (0.1-0.2 mg/kg) max 10 mg single dose. All routes: may repeat to total of 20 mg prn if SBP ≥ 90 (MAP ≥ 65) unless contraindicated. ↓ total dose to 0.1 mg/kg if elderly, debilitated, chronic diseases (HF/COPD); and/or on opiates or CNS depressants.

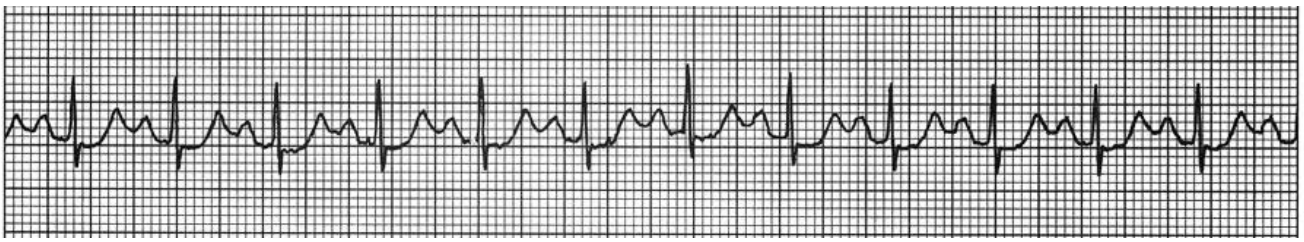
        If pain: FENTANYL 1 mcg/kg (max single dose 100 mcg) IVP/IN/IM/IO. May repeat once in 5 min: 0.5 mcg/kg (max dose 50 mcg). Max dose per SOP: 150 mcg (1.5 mcg/kg)

        Elderly (>65) or debilitated: 0.5 mcg/kg (max single dose 50 mcg) IVP/IN/IM/IO.

        Additional doses require OLMC: 0.5 mcg/kg q. 5 min up to a total of 3 mcg/kg (300 mcg) if indicated & available.

   d. If on beta blockers & unresponsive to atropine, norepinephrine (dopamine), and pacing: **GLUCAGON** 1 mg IVP/IN/IO/IM.

VI. Sinus tachycardia



A. **Description**: Increase in rate of sinus node discharge; HR > 100

B. **Etiology**

1. ↑ SNS tone: Excitement, exertion, exercise; caffeinated coffee, alcohol, smoking
2. Fever, infections, septic shock, hypoxia, hypovolemia, hypotension, HF, MI
3. Pain, anxiety
4. Drugs that increase sympathetic tone (epi, dopamine, cocaine)
5. Drugs that decrease the parasympathetic tone (atropine)
6. Anemia; pump failure; hyperthyroidism

C. **Characteristics**

1. Rate: 101-150 per minute (may go up to 180)
2. Rhythm: Regular
3. P waves (pacemaker site SA node)
   a. Normal and upright
   b. One to one relationship with each QRS
4. P-R interval: 0.12 - 0.20 seconds
5. QRS complex: 0.04 - 0.10 seconds (narrow or normal unless IVCD present)

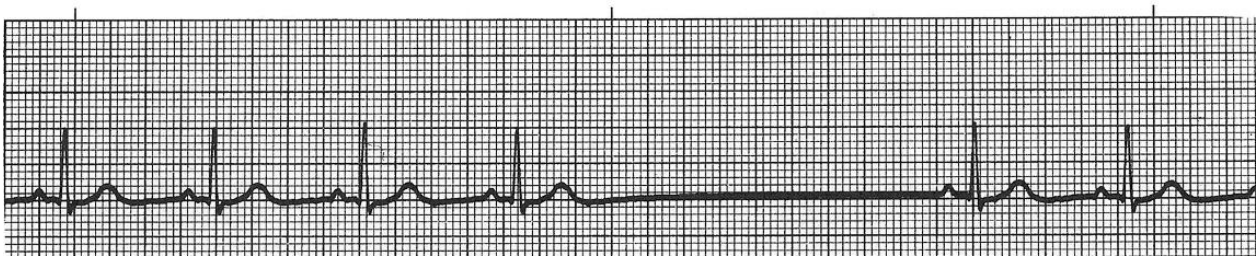
D. **Clinical significance**

1. May be benign or a compensatory mechanism for decreased stroke volume or increased metabolic demand by tissues.
2. If HR >140-150, ventricular filling time may be decreased and myocardial O_2 demand increased, so may precipitate S&S of chest pain, shortness of breath, and decreased cardiac output. This can produce ischemia or infarct in diseased hearts.

E. **Treatment - See NARROW QRS Complex Tachycardia** w/ pulse & HR > 100

1. Assess for physiologic stimulus (pain, fever, anemia, anxiety, drugs), hypoperfusion and cardiorespiratory compromise
2. **IMC:** Support ABCs; determine need for advanced airway management
   a. Identify rhythm; obtain, review and transmit 12 L ECG
   b. IV NS TKO in proximal vein (AC/external jugular)
   c. If unconscious/unstable: defer vascular access until after cardioversion
3. **Consider/treat for possible underlying causes**: cardiac ischemia, OD, compensation for other pathology etc.
   a. **Rate problem**: Tachycardia w/ or w/o coordination between atria & ventricles is reducing CO - use this SOP
   b. **Pump problem**: HR >100 & LV failure: see HF/Pulmonary Edema/Cardiogenic Shock
   c. **Volume problem**: See Hypovolemic Shock
   d. **Metabolic problem**: See Glucose Emergencies, Drug OD, & Renal emergencies
4. If possible ACS & alert + gag reflex; stable: Treat ischemia (ASA)/pain (fentanyl) per ACS SOP

VII. **Sinus block and/or arrest**



A. **Description**: SA node fails to discharge for a period of time resulting in the absence of any ECG wave for one or more cardiac cycles. Electrical activity is resumed when either the SA node resets itself and resumes discharge or when a lower latent pacemaker begins to discharge producing escape complex or rhythm.

B. **Etiology**

1. Sinus node ischemia; hypoxia
2. Hyperkalemia
3. Excessive vagal tone
4. Drugs: digitalis (toxicity), beta blockers, calcium channel blockers
5. Degenerative fibrotic disease of the SA node

C. **Characteristics list**

1. Rate
   a. Normal to slow
   b. Depends on frequency and duration of sinus arrest
2. Rhythm: Irregular with pauses that may be followed by escape beats
3. P waves: Normal in basic rhythm, absent during pause. Escape beats are not always preceded by a P wave if originating from the AV node or ventricles.
4. P-R interval: 0.12 - 0.20 (in sinus beats) and constant; absent during pause
5. QRS complex
   a. Normal during regular rhythm.
   b. May be narrow or wide in an "escape beat" generated after the pause. Narrow if originating in the AV node and wide if originating in the ventricles.

D. **Clinical significance**

1. Frequent or prolonged pauses may compromise cardiac output by decreasing rate and producing hypotension, dizziness or syncope.
2. Danger of complete cessation of sinus node activity with no escape beats resulting in cardiac standstill.

E. **Treatmen**t – Per Bradycardia with a pulse SOP

1. Observe only if patient is asymptomatic
2. Atropine, norepinephrine (dopamine) (drug profile attached to pulmonary edema handout), transcutaneous pacing if bradycardic and hypotensive

ATROPINE

Classification	Pharmacologic: Anticholinergic (Parasympatholytic)
Action	- Competes with the neurotransmitter acetylcholine for receptor sites, blocking the stimulation of parasympathetic nerve fibers. This blocking action enhances both sinus node automaticity and AV node conduction to indirectly increase HR (remove the brake to the heart). - ↓ GI motility - Dries secretions - Dilates bronchioles
Indications	- Symptomatic supraventricular bradycardia (Class I) unless contraindicated - AV blocks at the nodal level - 1° AVB or 2nd° Mobitz I (Class IIa; acceptable, probably helpful) - Cholinergic poisonings (organophosphates/WMD) - Neurogenic shock with bradycardia
Contraindications	- Known hypersensitivity - Infranodal AV block: 2° MII or 3° AVB with wide QRS complexes (Class III) - Unlikely to be effective in pts w/transplanted heart - Cushing's response in TBI - Avoid in hypothermic bradycardia
Packaging	Preload for most uses DuoDote Auto-injector: antidote for cholinergic chemical weapons poisoning
Dose & Route	**Symptomatic bradycardia due to cardiac cause**: 0.5 mg rapid IVP. Repeat **0.5 mg rapid IVP/IO** q. 3-5 min to max of 3 mg IVP if bradycardia & ↓ BP persists **Cholinergic poisoning**: 1 mg rapid IVP/IM. Repeat q. 3 minutes until reduction in secretions. May need large doses – usual dose limit does not apply. Cholinergic poisonings cause an accumulation of acetylcholine. Atropine blocks acetylcholine receptors, thus inhibiting parasympathetic stimulation. Also see Chemical Agents SOP. **Peds**: 0.02 mg/kg IV/IO Min. 0.1 mg **Max doses** Child single dose: 0.5 mg; total dose: 1 mg Adolescent single dose 1 mg; total dose 2 mg
Side Effects	- CNS: Sensorium changes; drowsiness, confusion (mad as a hatter); headache - CV: tachycardia; rarely VT or VF; ↑ myocardial O_2 demand - Eyes: dilated pupils (not fixed), blurred vision - GI: dry mouth. (dry as a bone) - Skin: warm, dry, flushed (red as a beet) - Drying of secretions (mouth, nose, eyes, bronchioles)
Precautions	- Push as fast as possible. Slow administration (resulting in low dose) or dose < 0.1 - 0.5mg may cause paradoxical bradycardia d/t central effect. - Use with caution in suspected ACS/AMI as HR is a major determinant of O_2 demand; excessive tachycardia can worsen ischemia or ↑ the area of infarction - When given to pts with nonsymptomatic bradycardia may produce adverse effects - If atropine is given with other anticholinergic drugs, additive effects may occur - Antacids slow the absorption of anticholinergic drugs

GLUCAGON (Glucagen)

Classification	Hormone produced using rDNA technology
Action	- Action opposes insulin; it initiates a series of enzymatic reactions that promotes the breakdown of glycogen to glucose (glycogenolysis) which raises the blood glucose levels. The degree to which glucagon ↑ blood glucose is dependent on liver glycogen reserves and presence of phosphorylases. - **Cardiac stimulant (+ inotrope) - causes release of catecholamines & stimulates c-AMP in cells to ↑ cardiac output *(allows the cells to be stimulated in the absence of beta receptor activity).*** - Relaxes smooth muscle of stomach, duodenum, small intestine, & colon
Indications	- Symptomatic bradycardia w/ pulse if on β blockers & unresponsive to atropine, pacing, & dopamine - Hypoglycemia w/o IV/IO - Anaphylaxis if on beta blockers & not responding to epinephrine &/or dopamine - β blocker OD if HR < 60 & not responding to epinephrine & dopamine
Packaging	Comes packaged as a powder to be mixed with diluent GlucaGen brand: reconstitute by adding 1 mL sterile water for injection Lilly brand: Use only the 1 mL diluent to reconstitute; do not use diluent with other drugs When reconstituting: Roll (don't shake) vial
Dose & Route	**Anaphylaxis/bradycardia on ß blockers & refractory to usual Rx** GLUCAGON 1 mg IVP/IN/IO/IM. [IN / IM BLS] **Hypoglycemia:** **≥ 20 kg :** 1 mg IVP/IN/IO/IM [IN / IM BLS] **< 20 kg**: 0.03 mg/kg IM/IN/IO up to 1 mg Onset IM: 5-20 min Peaks within 30 min Duration: 60-90 min
Side Effects	- GI: Vomiting common (protect airway before glucagon administration) - ↑ HR - Dyspnea
Contraindications	- Hypersensitivity - Adrenal gland dysfunction (adrenal insufficiency); adrenal tumor (pheochromocytoma) - Malnutrition, chronic hypoglycemia, pancreatic tumors, liver disease, an unusual or allergic reaction to glucagon, beef or pork products or preservatives (old formulations).
Precautions:	- Not as effective in treating hypoglycemia if no glycogen stores: peds, starvation or malnourished states, uremic or those w/ liver disease - Give supplemental carbohydrate ASAP if used for hypoglycemia

NWC EMSS Skill Performance Record

TRANSCUTANEOUS PACING

Name:	1st attempt:	☐ Pass	☐ Repeat
Date:	2nd attempt:	☐ Pass	☐ Repeat

An adult presents with chest pain following a syncopal episode. The patient weak and is c/o lightheadedness and feels like they may faint again.

Performance standard 0 Step omitted (or leave blank) 1 Not yet competent: Unsuccessful; required critical or excess prompting; marginal or inconsistent technique 2 Successful; competent with correct timing, sequence & technique , no prompting necessary	**Attempt 1 rating**	**Attempt 2 rating**
Prepare/assess patient * Confirm the need for pacing: bradycardia with hypoperfusion unresponsive to atropine and/or norepinephrine or drugs are contraindicated		
Initiate Initial Medical Care		
* Explain procedure to patient if conscious and oriented. Warn that procedure may be uncomfortable, muscles will twitch, and medication is available.		
* Remove all clothing from patient's chest; preserve modesty whenever possible		
* Skin prep: Remove all nitro patches, briskly wipe skin with a dry towel or gauze		
Prepare equipment ☐ Do NOT use electrodes if they have been removed from the foil package for more than 24 hours. ✓ electrodes for expiration date. ☐ Connect pace/defib cable to pace/defib electrodes by aligning arrows on connectors and pressing firmly. ☐ Slowly peel back protective liner on electrodes beginning with cable connection end. ☐ Inspect electrodes to make sure gel is moist, undamaged, and in the middle of the electrode. Do not use pads that are dried out or damaged as this may cause electrical arcing and patient skin burns. ☐ Avoid spilling any fluids on the adapters, cables, connectors, or electrodes. ☐ Do not clean the electrodes or their permanently attached electrode cable with alcohol Note: One electrode set can be used for up to 50 shocks at any energy setting. They can withstand a continuous pacing current for 12 hrs and can remain on pt for 24 hours.		
* **Apply pacing pads** either anterior-posterior (preferred) or anterior-lateral ☐ **Anterior-posterior**: Place negative electrode on left anterior chest halfway between xiphoid process and left nipple line (See drawing next page). ☐ Place positive electrode on left posterior chest below scapula, lateral to spine. ☐ **Anterior-lateral**: Place the anterior electrode (black electrode) without wrinkles or gaps on the patient's right upper torso, lateral to the sternum and below the clavicle. ☐ Place the lateral (♥) red electrode without wrinkles or gaps under and lateral to the patient's left nipple in the midaxillary line, with the center of the electrode in the midaxillary line. ☐ Avoid placing pads over bony prominences (sternum/scapula) or breasts. ☐ Smooth electrode center and edges onto patient's chest to eliminate air pockets between gel surface and skin. Firmly press all adhesive edges to skin.		
* Select leads I, II, or III. Cannot pace if lead select switch is on paddles.		
* Connect limb lead ECG electrodes to the patient cable and apply to patient. Allow at least 2-3 cm between monitoring and pacing electrodes to prevent current arcing.		
Prepare fentanyl and midazolam for use if needed		
Perform procedure: Varies by monitor manufacturer * Turn the monitor on		
* Confirm the native rhythm; adjust gain so R waves can be sensed. Should see a "•" on each R wave. If no dot markers appear, adjust ECG size or select another lead.		
* Turn pacing button on. Set rate at 60 BPM. May adjust rate to 70 BPM based on clinical response.(Some monitors preset at rate of 70)		
* Confirm presence of pacing spikes at set rate		
* Push start/stop button		

Performance standard 0 Step omitted (or leave blank) 1 Not yet competent: Unsuccessful; required critical or excess prompting; marginal or inconsistent technique 2 Successful; competent with correct timing, sequence & technique , no prompting necessary	**Attempt 1 rating**	**Attempt 2 rating**
☐ Device turns on at 0 mA. * If pt is awake w/ pulse: Slowly increase in 5 mA increments until evidence of electrical capture (pacer spike followed by a wide QRS). Troubleshoot failure to capture. ☐ Assess femoral pulse for mechanical capture. Halt at lowest mA at which 1:1 mechanical capture takes place. ☐ If pt unconscious: Rapidly turn up in 20 mA increments until evidence of mechanical capture is present.		
* Continue upward adjustment of mA until mechanical capture or 200 mA		
* Assess for response to the procedure (VS in right arm, femoral pulse; mental status, SpO_2, pain).		
If no mechanical capture at 200 mA, push stop button and reposition electrodes, check for good skin contact. Push start and slowly increases mA again.		
Evaluate patient - If successful: Assess need for sedation & pain mgt: If SBP ≥ 90 (MAP≥ 65): ☐ Sedation: MIDAZOLAM 2 mg increments slow IVP q. 2 min (0.2 mg/kg IN) up to 10 mg IVP/IN titrated to pt response. If IV unable and IN contraindicated: IM dose 5-10 mg (0.1-0.2 mg/kg) max 10 mg single dose. All routes: may repeat to total of 20 mg prn if SBP ≥ 90 (MAP ≥ 65) unless contraindicated. ↓ total dose to 0.1 mg/kg if elderly, debilitated, chronic diseases (HF/COPD); and/or on opiates or CNS depressants. ☐ **If pain**: **FENTANYL 1 mcg/kg** (max single dose 100 mcg) IVP/IN/IM/IO. May repeat once in 5 min: 0.5 mcg/kg (max dose 50 mcg). Max dose per SOP: 150 mcg (1.5 mcg/kg). **Elderly** (>65) or **debilitated**: **0.5 mcg/kg** (**max single dose 50 mcg)** IVP/IN/IM/IO. **Additional doses require OLMC:** 0.5 mcg/kg q. 5 min up to a total of 3 mcg/kg (300 mcg) if indicated & available. ☐ If considerable muscle twitching: readjust lateral pad away from pectoral muscle ☐ Complete IMC and prepare for transport.		
If no mechanical capture and pulse present: *Continue norepinephrine per SOP		
Continue to reassess patient for pulses & hemodynamic response		
Critical Criteria - Check if occurred during an attempt ☐ Failure to differentiate patient's need for immediate transportation versus continued assessment and treatment at the scene ☐ Failure to determine the patient's primary problem ☐ Performs any improper technique resulting in potential for patient harm ☐ Exhibits unacceptable affect with patient or other personnel ☐ Uses or orders a dangerous or inappropriate intervention		

Factually document below your rationale for checking any of the above critical criteria.

_____

_____

Scoring: All steps must be independently performed in correct sequence with appropriate timing and all starred (*) items must be explained/ performed correctly in order for the person to demonstrate competency. Any errors or omissions of these items will require additional practice and a repeat assessment of skill proficiency.

Rating: (Select 1)

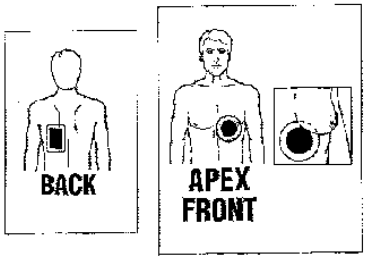
☐ **Proficient**: The paramedic can sequence, perform and complete the performance standards independently, with expertise and to high quality without critical error, assistance or instruction.
☐ **Competent:** Satisfactory performance without critical error; minimal coaching needed.
☐ **Practice evolving/not yet competent:** Did not perform in correct sequence, timing, and/or without prompts, reliance on procedure manual, and/or critical error; recommend additional practice

CJM 12/16 _____

Preceptor (PRINT NAME – signature)

Notes:

Muscle twitching does not mean that the pacemaker is producing good cardiac output. Effective capture should improve hemodynamic status.
Troubleshooting failure to capture: ✓ pads for good skin contact; correct placement; correct lead selection; snug wire connections

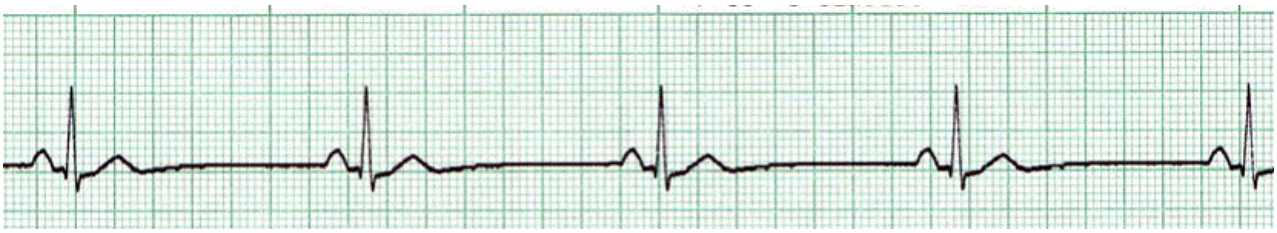


Homework Compliance
Student's name:
Homework officer check: [ ] **C** (complete/accurate) [ ] **I** (incomplete/inaccurate)
Homework officer's name and initials:
TURN INTO LEAD INSTRUCTOR by 9:00am for verification
Lead instructor's determination & signature: ☐ Acceptable as submitted ☐ Revision/completion required

1. What are the possible underlying causes of bradycardia with a pulse?

2. In what situations may sinus bradycardia be a person's normal rhythm?

3. List the characteristics of the following rhythm:



Rate:

R to R (reg or irreg):

Pacemaker site:

P waves present?

PR interval:

QRS complexes present?

QRS duration:

P/QRS ratio:

4. Are drugs or pacing indicated for every patient with sinus bradycardia?

Why or why not?

5. What signs or symptoms indicate the need for treatment?

6. What is the classification of atropine?_____

7. What is its intended action?

_____

_____

8. Which of these patients should receive atropine?

A. Alert but weak w/ SOB; BP 118/80; P 60; R 20
B. Chest pain and altered mental status; BP 84/50; P 82; R 24
B. AMI who is alert; with warm, dry skin; BP 120/90, P 50, R 18
D. AMI presenting with lethargy & diaphoresis; BP 84/60; P 50; R 18

9. List 2 contraindications for giving atropine to a bradycardic patient with a pulse.

_____

_____

10. What is the initial dose of atropine for a patient who is bradycardic with a pulse?

_____

11. What effect can atropine have on an evolving MI?

_____

12. List three common side effects of atropine:

_____

_____

_____

13. What is the maximum dose of atropine for bradycardia with a pulse due to a cardiac cause?

_____

14. If a bradycardic patient is taking beta blockers and atropine, norepinephrine, and pacing are unsuccessful in generating an acceptable cardiac output, why is glucagon indicated? What is the action of this drug for these patients?

_____

_____

15. What is the dose and route of glucagon for a bradycardic patient with a pulse?

_____

16. How should glucagon be mixed for administration?

_____

_____

17. An elderly female presents is confused and feeling faint. She denies chest pain, nausea, or SOB. She denies any allergies or PMH and doesn't remember the name of her meds. Her skin is pale, cool, and moist. VS: BP 88/62; P 40 and irregular; lungs clear. The monitor shows sinus bradycardia with occasional PVCs. IMC has been completed. Which of these is indicated next?

A. Atropine 0.5 mg IVP
B. Transcutaneous pacing
C. Amiodarone 150 mg slow IVP
D. Transport without further treatment

18. If a pulse is present, but remains slow following atropine and the patient is extremely hypotensive, what drug should be prepared for administration?

_____

19. What ECG leads must be applied to a patient in order to pace them? (See procedure manual)

_____

20. What monitor lead setting should be selected when pacing?

A. Leads I, II, or III
B. aVR
C. aVF
D. Paddles

21. What confirmation is seen on the monitor indicating that it is sensing the native R waves?

_____

22. What should be the initial heart rate setting for transcutaneous pacing?

_____

What is the maximum HR at which PMs are authorized to pace per SOP?

_____

23. When pacing a patient, what observation confirms that the monitor is discharging current at the heart rate selected (What is seen on the ECG)?

_____

24. How should electrical capture be confirmed on the ECG?

_____

25. How should mechanical capture be confirmed?

_____

26. At what mA is the pacemaker set when starting the Transcutaneous pacing procedure?

_____

27. What is the upper limit of mA for transcutaneous pacing?_____

28. If there is no mechanical capture at the upper limits of mA, what action is indicated situation?

_____

_____

29. If mechanical capture is achieved and the patient is hemodynamically stable but not tolerating the procedure well, what drug (dose & route) should be given to induce amnesia and provide sedation?

_____

30. If mechanical capture is achieved and a patient is now hemodynamically stable but in intense pain due to ischemia or the pacing process, what drug (dose & route) should be given for pain?

_____

31. List two contraindications for giving that analgesic drug.

_____

_____

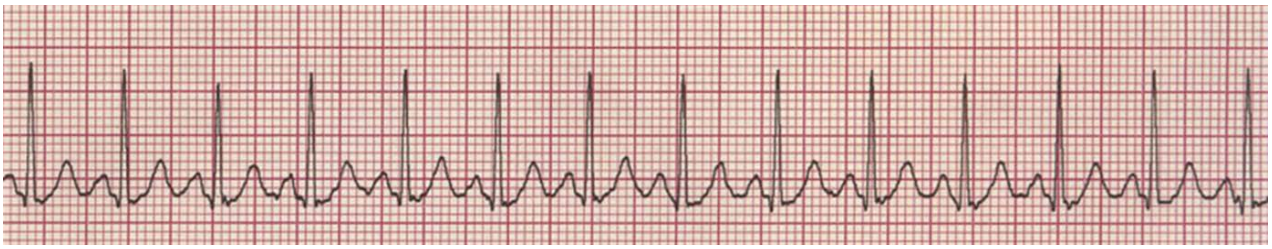
32. List three causes of sinus tachycardia

_____

_____

_____

33. List the characteristics of the following rhythm



Rate:_____

R-R reg or irregular:_____

Pacemaker site:_____

P waves present?_____

PR interval:_____

QRS complexes present?_____

QRS duration:_____

P/QRS ratio:_____

34. What is the possible clinical significance of sinus tachycardia?

_____

_____

35. Which SOP gives guidelines for treating sinus tachycardia?

_____

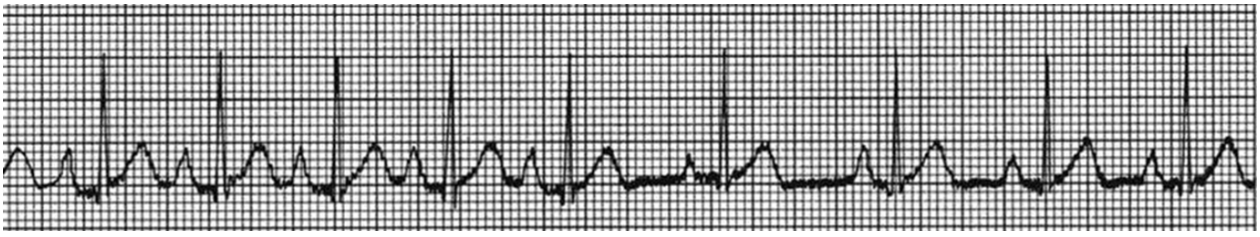
36. What is the goal when treating sinus tachycardia?

_____

37. List one cause of sinus dysrhythmia:

_____

38. List the characteristics of the following rhythm



Rate:_____

Rhythm:_____

Pacemaker site:_____

P waves present?_____

PR interval:_____

QRS complexes present?_____

QRS duration:_____

P/QRS ratio:_____

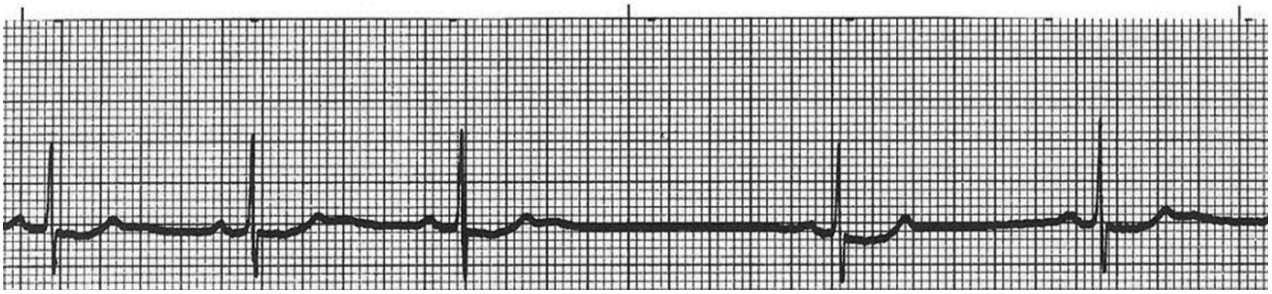
39. Is there any clinical significance to sinus dysrhythmia most of the time?_____

40. List two causes of sinus arrest or block:

_____

_____

41. List the characteristics of the following rhythm:



Rate:_____

Rhythm:_____

Pacemaker site:_____

P waves present?_____

PR interval:_____

QRS complexes present?_____

QRS duration:_____

P/QRS ratio:_____

42. What clinical S&S may the patient exhibit with sinus block or arrest?

_____

_____

43. What would be the indicated treatment for a patient with clinically significant sinus arrest resulting in bradycardia and hypotension?

_____

_____