Bradycardia-Pediatric

Aliases

Heart block, junctional rhythm

Patient Care Goals

1. Maintain adequate perfusion.
2. Treat underlying cause:
    a. Hypoxia
    b. Shock
    c. Second or third-degree AV block
    d. Toxin exposure (beta-blocker, calcium channel blocker, organophosphates, digoxin)
    e. Electrolyte disorder
    f. Hypoglycemia
    g. Increased intracranial pressure (ICP)
    h. Other

Patient Presentation

Inclusion Criteria

1. Heart rate less than 50 beats per minute with either symptoms (AMS, CP, CHF, seizure, syncope, shock, pallor, diaphoresis) or evidence of hemodynamic instability
2. The major ECG rhythms classified as bradycardia include:
    a. Sinus bradycardia
    b. Second-degree AV block
        i. Type I —Wenckenbach/Mobitz I
        ii. Type II —Mobitz II
    c. Third-degree AV block complete block
    d. Ventricular escape rhythms

Exclusion Criteria

No recommendations

Patient Management

Treatment is only indicated for patients who are symptomatic (pale and/or cyanotic, diaphoretic, altered mental status, hypoxic)

a. Initiate chest compressions for heart less than 60 and signs of poor perfusion (altered mental status, hypoxia, hypotension, weak pulse, delayed capillary refill, cyanosis).
b. Manage airway and assist ventilations as necessary with minimally interrupted chest compressions using a compression to ventilation ratio 15:2 (30:2 if single provider is present).
c. Administer oxygen ***[EMR]*** as appropriate for dyspnea or distress with a target of achieving greater than 93% saturation for most acutely ill patients.
d. Initiate ECG monitoring and perform 12-lead ECG
e. Establish IV access ***[AEMT].***
f. Check blood glucose and treat hypoglycemia per the Hypoglycemia guideline.
g. Consider underlying etiologies for bradycardia: Toxin/Drugs (Poisoning and Overdose Universal Care Guideline), Medications (Beta-blockers Poisoning/Overdose Guideline, Calcium channel blockers Poisoning/Overdose Guideline), Acute Coronary Syndrome, Hypothermia, Head Injury, Stroke, Spinal cord injury, Cholinergic nerve agents.
h. Consider the following additional therapies if bradycardia and symptoms or hemodynamic instability continue after adequate ventilation and oxygenation:
    i. **Epinephrine *[PARA]***
        a. Push-Dose: **5-10mcg IV/IO every 3-5minutes titrated to MAP greater than 65**

mmHg (or age appropriate MAP)(Mix 1ml of epinephrine 1mg/10mL in 9ml of NS yielding a new mixture of 100 mcg in 10 ml = 10 mcg/1 mL)

b. Severe hemodynamic compromise attributed to bradycardia**: 0.01 mg/kg (max 1mg) IV/IO every 3-5 minutes**

ii. **Atropine *[PARA]*** if increased vagal tone or cholinergic drug toxicity

a. **0.02mg/kg IV every 5 minutes.**
   - **Minimum single dose 0.1mg**
   - **Maximum Single Dose 1mg.**
   - **Maximum total dose of 3 mg**

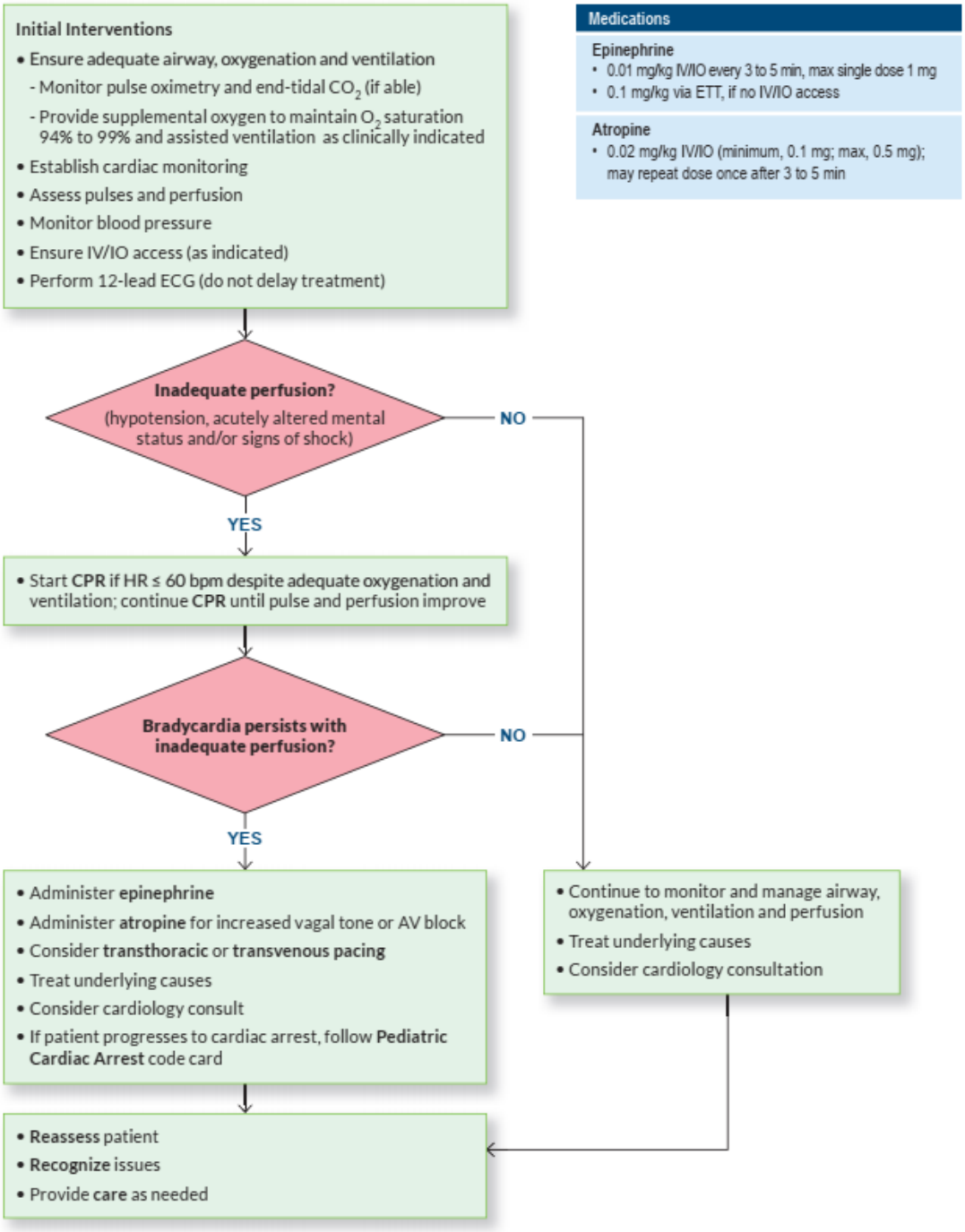
iii. Transcutaneous pacing ***[PARA]***; if pacing is performed, consider sedation or pain control

a. Set Pacer rate to 80 bpm

b. Set Pacer output to 10mA and increase until mechanical capture

PEDIATRIC BRADYCARDIA WITH A PULSE

PALS - 2020 VERSION

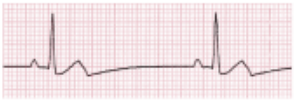
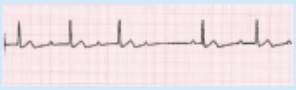
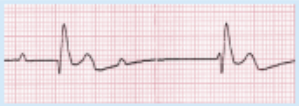


American Red Cross
Training Services

PEDIATRIC BRADYCARDIA WITH A PULSE

PALS - 2020 VERSION

Age Group	Awake Heart Rate (Beats per Minute)
Newborn	100–200
Infant (1 to 12 months)	100–180
Toddler (1 to 2 years)	90–140
Preschooler (3 to 5 years)	80–130
School Age (6 to 12 years)	70–120
Adolescent (13 to 17 years)	60–100

Bradyarrhythmia	ECG Features	
Sinus bradycardia	Sinus origin, but HR lower than normal for age	
Second-degree AV block type I	Repeated pattern of progressively delayed atrial conduction (prolonged PR interval) followed by completely blocked conduction (dropped beat)	
Second-degree AV block type II	Some atrial impulses conducted and others not, but no progressive delays; blocked impulses may occur in a pattern (e.g., 2:1; 3:1 or 4:1 in high-grade block)	
Third-degree AV block	No atrial impulses conducted to ventricles (AV dissociation)	

Patient Safety Considerations

If pacing is performed, consider sedation or pain control.

Notes and Educational Pearls

Key Considerations

1. Observe for signs of decreased end-organ perfusion: chest pain (CP), shortness of breath (SOB), decreased level of consciousness, syncope or other signs of shock/hypotension.
2. Be aware that patients who have undergone cardiac transplant will not respond to atropine.
3. Consider potential culprit medications including beta-blockers, calcium channel blockers, sodium channel blockers/anti-depressants, digoxin, and clonidine. **Note:** If medication overdose is considered, refer to appropriate guidelines in the Toxins and Environmental section
4. Consider whether the differential diagnosis includes the following: MI, hypoxia, pacemaker failure, hypothermia, sinus bradycardia, athletes, head injury with increased ICP, stroke, spinal cord lesion, sick sinus syndrome, AV blocks, overdose, cholinergic nerve agents.
5. Consider hyperkalemia in the patient with wide complex bradycardia.
6. Manage bradycardia via the least invasive manner possible, escalating care as needed.
    - Third-degree heart block or the denervated heart (as in cardiac transplant) may not respond to atropine and in these cases, proceed quickly to chronotropic agents (such as epinephrine or dopamine), or transcutaneous pacing.
    - Dopamine is not indicated for pediatric patients.
    - In cases of impending hemodynamic collapse, proceed directly to transcutaneous pacing.
7. Be aware of acute coronary syndrome as a cause of bradycardia in adult patients.
8. When dosing medications for pediatric patients, dose should be weight-based for non-obese patients and based on ideal body weight for obese patients.
9. Although Dopamine is often recommended for the treatment of symptomatic bradycardia, recent

research suggests that patients in cardiogenic or septic shock treated with Norepinephrine have a lower mortality rate compared to those treated with Dopamine.

10. **Caution:** Norepinephrine can theoretically cause reflex bradycardia.

Pertinent Assessment Findings

1. No recommendations

Quality Improvement

Associated NEMSIS Protocol(s) (eProtocol.01)

1. 9914115—Medical-Bradycardia

Key Documentation Elements

1. Cardiac rhythm and rate
2. Time, dose, and response of medications given
3. Pacing: Time started or stopped, rate, joules, capture and response, rate,
4. Patient weight
5. Pediatric length-based tape color (for pediatrics who fit on tape)
6. History of event supporting treatment of underlying causes

Performance Measures

1. Blood sugar obtained
2. Correct medication(s) and dose given for patient condition, age and weight
3. Correct application and use of cardiac pacing
4. Use of sedation or pain management with cardiac pacing
5. ***EMS Compass® Measures*** *(for additional information, see www.emscompass.org)*
    - *PEDS-03: Documentation of estimated weight in kilograms.:* Frequency that weight or length-based estimate are documented in kilograms
    - *Hypoglycemia-01: Treatment administered for hypoglycemia.* Measure of patients who received treatment to correct their hypoglycemia

References

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4. Kleinman ME, Chameides L, Schexnayder SM, et al. Part 14: pediatric advanced life support. *Circulation*. 2010;122(18 Suppl.3):S876-S908.
5. Link MS, Berkow PJ, Kudenchuk HR, et. al. Part 7: adult advanced cardiovascular life support. *Circulation*. 2015;132(18 Suppl 2):S444-64.
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7. Weingart S. *EMCrit Podcast 6 – Push-Dose Pressors*. July 10, 2009. http://emcrit.org/podcasts/bolus-dose-pressors/. Accessed February 1, 2017.
8. Weingart S. Push-dose pressors for immediate blood pressure control. *Clin Exp Emerg Med*. 2015;2(2):131-132.