Adult Bradycardia With a Pulse Algorithm

1. Assess appropriateness for clinical condition. Heart rate typically <50/min if bradyarrhythmia.

2. Identify and treat underlying cause
   - Maintain patent airway; assist breathing as necessary
   - Oxygen (if hypoxemic)
   - Cardiac monitor to identify rhythm; monitor blood pressure and oximetry
   - IV access
   - 12-Lead ECG if available; don’t delay therapy

3. Persistent bradyarrhythmia causing:
   - Hypotension?
   - Acutely altered mental status?
   - Signs of shock?
   - Ischemic chest discomfort?
   - Acute heart failure?

4. Monitor and observe
   - No

5. Atropine
   - If atropine ineffective:
     - Transcutaneous pacing
     - Dopamine infusion
     - Epinephrine infusion

6. Consider:
   - Expert consultation
   - Transvenous pacing

Doses/Details

**Atropine IV dose:**
First dose: 0.5 mg bolus. Repeat every 3-5 minutes. Maximum: 3 mg.

**Dopamine IV infusion:**
Usual infusion rate is 2-20 mcg/kg per minute. Titrate to patient response; taper slowly.

**Epinephrine IV infusion:**
2-10 mcg per minute infusion. Titrate to patient response.
Adult Tachycardia With a Pulse Algorithm

1. Assess appropriateness for clinical condition. Heart rate typically ≥150/min if tachyarrhythmia.

2. Identify and treat underlying cause
   - Maintain patent airway; assist breathing as necessary
   - Oxygen (if hypoxemic)
   - Cardiac monitor to identify rhythm; monitor blood pressure and oximetry

3. Persistent tachyarrhythmia causing:
   - Hypotension?
   - Acutely altered mental status?
   - Signs of shock?
   - Ischemic chest discomfort?
   - Acute heart failure?

4. Synchronized cardioversion
   - Consider sedation
   - If regular narrow complex, consider adenosine

5. Wide QRS? ≥0.12 second
   - Yes
     - IV access and 12-lead ECG if available
     - Vagal maneuvers
     - Adenosine (if regular)
     - β-Blocker or calcium channel blocker
     - Consider expert consultation
   - No

6. Yes
   - IV access and 12-lead ECG if available
   - Consider adenosine only if regular and monomorphic
   - Consider antiarrhythmic infusion
   - Consider expert consultation

7. Yes
   - Consider sedation

Doses/Details

**Synchronized cardioversion:**
- Initial recommended doses:
  - Narrow regular: 50-100 J
  - Narrow irregular: 120-200 J
  - Wide regular: 100 J
  - Wide irregular: defibrillation dose (not synchronized)

**Adenosine IV dose:**
- First dose: 6 mg rapid IV push; follow with NS flush.
- Second dose: 12 mg if required.

**Antiarrhythmic Infusions for Stable Wide-QRS Tachycardia**

**Procainamide IV dose:**
- First dose: 20-50 mg/min until arrhythmia suppressed, hypotension ensues, QRS duration increases >50%, or maximum dose 17 mg/kg given.
- Maintenance infusion: 1-4 mg/min. Avoid if prolonged QT or CHF.

**Amiodarone IV dose:**
- First dose: 150 mg over 10 minutes.
- Repeat as needed if VT recurs.
- Follow by maintenance infusion of 1 mg/min for first 6 hours.

**Sotalol IV dose:**
- 100 mg (1.5 mg/kg) over 5 minutes. Avoid if prolonged QT.

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Start CPR
• Give oxygen
• Attach monitor/defibrillator

1. Start CPR

2. Yes

2. No

3. VF/pVT

4. CPR 2 min
   • IV/IO access

5. Yes

5. No

6. CPR 2 min
   • Epinephrine every 3-5 min
   • Consider advanced airway, capnography

7. Yes

7. No

8. CPR 2 min
   • Amiodarone
   • Treat reversible causes

9. Asystole/PEA

10. CPR 2 min
    • IV/IO access
    • Consider advanced airway, capnography

11. CPR 2 min
    • Treat reversible causes

12. No

12. No

12. Yes

12. If no signs of return of spontaneous circulation (ROSC), go to 10 or 11
   • If ROSC, go to Post–Cardiac Arrest Care

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CPR Quality
• Push hard (at least 2 inches [5 cm]) and fast (100-120/min) and allow complete chest recoil.
• Minimize interruptions in compressions.
• Avoid excessive ventilation.
• Rotate compressor every 2 minutes, or sooner if fatigued.
• If no advanced airway, 30:2 compression-ventilation ratio.
• Quantitative waveform capnography:
  - If PetCO2 <10 mm Hg, attempt to improve CPR quality.
• Intra-arterial pressure
  - If relaxation phase (diastolic) pressure <20 mm Hg, attempt to improve CPR quality.

Shock Energy for Defibrillation
• Biphasic: Manufacturer recommendation (eg, initial dose of 120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
• Monophasic: 360 J

Drug Therapy
• Epinephrine IV/IO dose: 1 mg every 3-5 minutes
• Amiodarone IV/IO dose: First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway
• Endotracheal intubation or supraglottic advanced airway
• Waveform capnography or capnometry to confirm and monitor ET tube placement
• Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)
• Pulse and blood pressure
• Abrupt sustained increase in PetCO2 (typically ≥40 mm Hg)
• Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes
• Hypovolemia
• Hyoxia
• Hydrogen ion (acidosis)
• Hypo-/hyperkalemia
• Hypothermia
• Tension pneumothorax
• Tamponade, cardiac
• Toxins
• Thrombosis, pulmonary
• Thrombosis, coronary
**Doses/Details**

**Ventilation/oxygenation:**  
Avoid excessive ventilation. Start at 10 breaths/min and titrate to target \( \text{PETCO}_2 \) of 35-40 mm Hg. When feasible, titrate \( \text{FiO}_2 \) to minimum necessary to achieve \( \text{SpO}_2 \) ≥94%.

**IV bolus:**  
Approximately 1-2 L normal saline or lactated Ringer’s

**Epinephrine IV infusion:**  
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

**Dopamine IV infusion:**  
5-10 mcg/kg per minute

**Norepinephrine IV infusion:**  
0.1-0.5 mcg/kg per minute (in 70-kg adult: 7-35 mcg per minute)

**Reversible Causes**

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

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Acute Coronary Syndromes Algorithm—2015 Update

1. Symptoms suggestive of ischemia or infarction

2. EMS assessment and care and hospital preparation:
   - Monitor, support ABCs. Be prepared to provide CPR and defibrillation
   - Administer aspirin and consider oxygen, nitroglycerin, and morphine if needed
   - Obtain 12-lead ECG; if ST elevation:
     - Notify receiving hospital with transmission or interpretation; note time of onset and first medical contact
   - Notified hospital should mobilize hospital resources to respond to STEMI
   - If considering prehospital fibrinolysis, use fibrinolytic checklist

3. Concurrent ED assessment (<10 minutes)
   - Check vital signs; evaluate oxygen saturation
   - Establish IV access
   - Perform brief, targeted history, physical exam
   - Review/complete fibrinolytic checklist; check contraindications
   - Obtain initial cardiac marker levels, initial electrolyte and coagulation studies
   - Obtain portable chest x-ray (<30 minutes)

4. ECG interpretation

5. ST elevation or new or presumably new LBBB; strongly suspicious for injury
   ST-elevation MI (STEMI)
   - Start adjunctive therapies as indicated
   - Do not delay reperfusion

6. Time from onset of symptoms ≤12 hours?
   - >12 hours
   - ≤12 hours

7. Reperfusion goals:
   Therapy defined by patient and center criteria
   - Door-to-balloon inflation (PCI) goal of 90 minutes
   - Door-to-needle (fibrinolysis) goal of 30 minutes

8. Troponin elevated or high-risk patient
   Consider early invasive strategy if:
   - Refractory ischemic chest discomfort
   - Recurrent/persistent ST deviation
   - Ventricular tachycardia
   - Hemodynamic instability
   - Signs of heart failure
   Start adjunctive therapies (eg, nitroglycerin, heparin) as indicated

9. ST depression or dynamic T-wave inversion; strongly suspicious for ischemia
   High-risk non-ST-elevation ACS (NSTE-ACS)

10. Normal or nondiagnostic changes in ST segment or T wave
    Low-/Intermediate-risk ACS

11. Consider admission to ED chest pain unit or to appropriate bed for further monitoring and possible intervention.

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Opioid-Associated Life-Threatening Emergency (Adult) Algorithm—New 2015

**Assess and activate.**
Check for unresponsiveness and call for nearby help. Send someone to call 9-1-1 and get AED and naloxone. Observe for breathing vs no breathing or only gasping.

**Begin CPR.**
If victim is unresponsive with no breathing or only gasping, begin CPR.*
If alone, perform CPR for about 2 minutes before leaving to phone 9-1-1 and get naloxone and AED.

**Administer naloxone.**
Give naloxone as soon as it is available.
2 mg intranasal or 0.4 mg intramuscular.
May repeat after 4 minutes.

**Does the person respond?**
At any time, does the person move purposefully, breathe regularly, moan, or otherwise respond?

- **Yes**
  - Continue to check responsiveness and breathing until advanced help arrives.
  - If the person stops responding, begin CPR and repeat naloxone.

- **No**
  - Continue CPR and use AED as soon as it is available.
  - Continue until the person responds or until advanced help arrives.

*CPR technique based on rescuer’s level of training.

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