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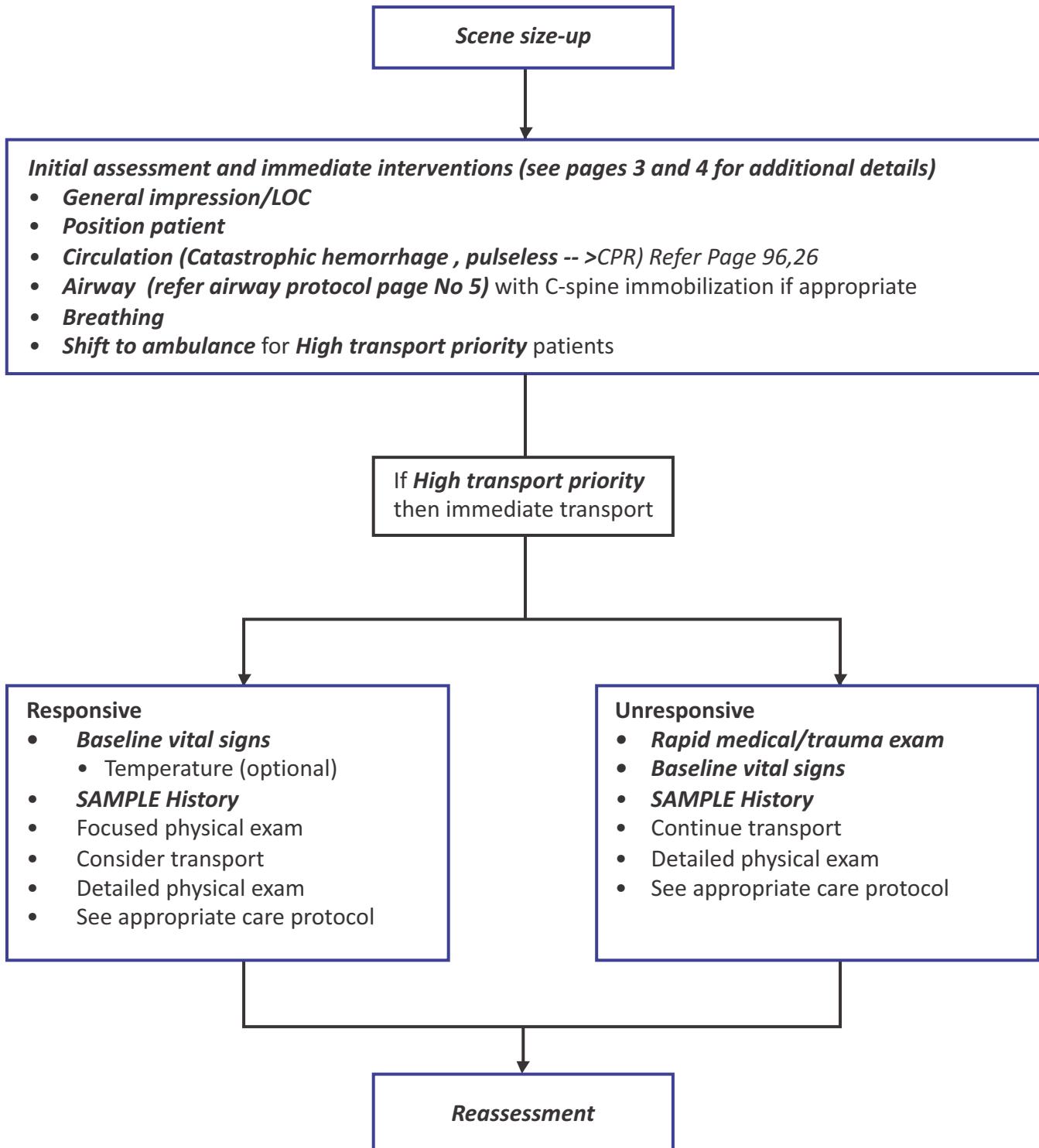
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ROUTINE MEDICAL/TRAUMA CARE



ROUTINE MEDICAL/TRAUMA CARE

Scene size-up

- Personal protective equipment
- Scene safety
- Number of patients
- Additional resources
- Nature of illness and/or mechanism of injury

Initial assessment and immediate interventions

- See following page

High transport priority

- Immediate life threats (problem with CABs)
- Unsafe scene
- Consider in the following patients
(A FACT)
 - Active labor
 - Focal weakness (possible stroke)
 - Altered mental status/Active seizure
 - Chest pain
 - Trauma with significant mechanism of injury or concerning symptom(s)

Rapid medical/trauma exam

- Head for DCAP-BTLS
- Pupil size and responsiveness
- Odors
- Neck for tracheal deviation, distended neck veins and DCAP-BTLS
- Listen for breath sounds
- Listen for heart sounds
- Chest, abdomen and pelvis for DCAP-BTLS
- Extremities for pulses, sensation, movement and DCAP-BTLS
- Skin for rash, temperature

Baseline vital signs

- Pulse rate
- Blood pressure
- Respiratory rate
- Pulse oximetry

SAMPLE History

- Symptoms & Signs
 - OPQRSTU
- Allergies
- Medications
- Past medical history
- Last meal
- Events leading up to illness or injury

OPQRSTU

- Onset
- Provocation
- Quality
- Region and Radiation
- Severity
- Timing
- Unifying symptoms

Reassessment

- Repeat vital signs
 - Every 5 minutes if critical patient
 - Every 15 minutes if stable patient
- Repeat focused history
- Repeat focused exam
- Evaluate response to interventions

Initial Assessment and Immediate Interventions

General impression/LOC

- Assess AVPU
 - Alert
 - Responds to Voice
 - Responds to Pain
 - Unresponsive

Position Patient

- Conscious, no trauma, gag reflex present: Position of comfort
- Depressed LOC, no trauma, decreased gag reflex:
Left lateral decubitus position
- Trauma: Spinal immobilization if appropriate
- Pregnancy >20 weeks: Semi-upright or left lateral decubitus position
 - If patient requires spinal immobilization, secure to backboard then tilt 20-30 degrees to left and transport
- Respiratory distress: Sitting upright or position of comfort

Circulation

- Control active hemorrhage with direct pressure
- Initiate CPR, if unresponsive and no pulse (see CPR protocol) *Refer Page 26*
- Defibrillate, if available and indicated

Airway

- Open airway - head tilt/chin lift; use jaw thrust if suspected c-spine injury
- Adjunctive airway device, as needed
 - Oropharyngeal airway - unresponsive, no gag reflex
 - Nasopharyngeal airway - responsive, gag reflex present
- Suction, as needed

Breathing

- Oxygen administration *Refer Page 10*
 - Administer O₂ appropriate to patient condition
 - For signs of respiratory distress, initiate O₂ by 15 L/min non-rebreather mask
 - If COPD history, *DO NOT* withhold O₂ but observe closely for respiratory depression or decreasing LOC
 - Use SpO₂ as a guide only; the patient may require O₂ even if normal SpO₂
- Assist ventilation as needed by bag-mask ventilation

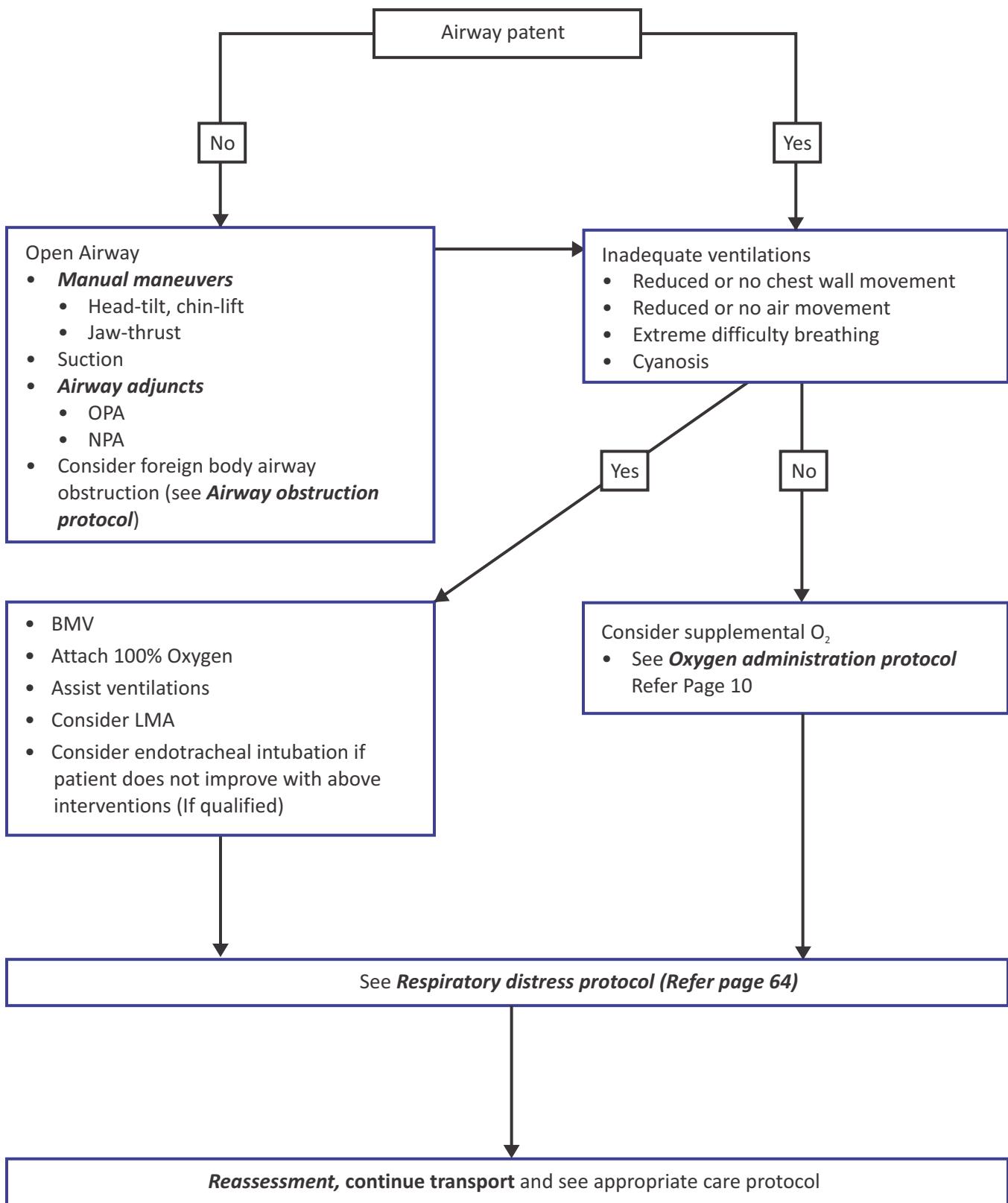
Shift to ambulance

- Immediately for **High transport priority** patients
- Collect patient medications and bring to hospital if possible

Immediate Interventions

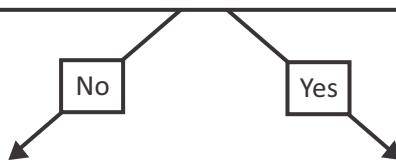
- Position
- Control bleeding
- CPR
- Defibrillate
- Open airway
- O₂
- BMV
- Shift to ambulance
- Cardiac monitor
- IV
- GRBS (glucose)

AIRWAY MANAGEMENT



Manual maneuvers

- Possible cervical spine injury -OR-
- Neck or back pain -OR-
- Numbness, weakness, or paresthesias



Head tilt-chin lift maneuver



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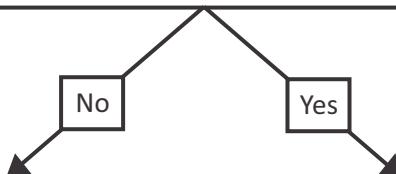
Jaw-thrust maneuver



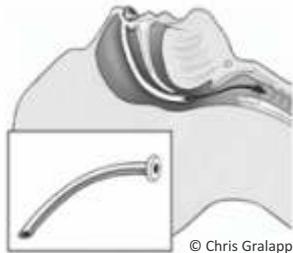
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Airway adjuncts

- Unresponsive -OR-
- Signs of facial or basilar skull fracture -OR-
- No cough or gag reflex

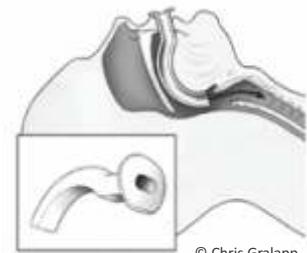


Nasopharyngeal airway (NPA)



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Oropharyngeal airway (OPA)



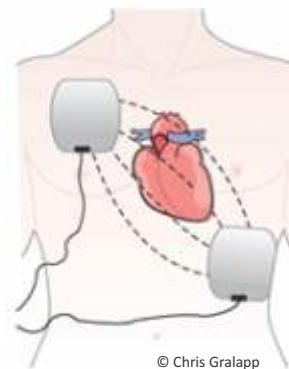
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- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.

AUTOMATED EXTERNAL DEFIBRILLATOR (AED)

1. Open and turn on the AED
2. Dry patient if sweaty
3. Remove hair with razor if needed
4. Place electrodes in anterior/apex (diagram) or front/back (page 11) position
5. Make sure electrodes are plugged into AED
6. AED will analyze the cardiac rhythm
7. AED will tell you if and when to press the shock button
8. Prior to pressing the shock button, everyone step back from the patient,
"I'm clear, you're clear, everybody clear"
9. Deliver shock
10. Resume CPR immediately
11. If no shock advised - check pulse, if no pulse resume CPR



CARDIAC MONITORING

- Continuous electrocardiography (ECG) assesses cardiac rhythm
- Use in patients with abnormal vital signs, altered mental status, chest pain, or shortness of breath
- Monitors may be 4 lead (limb leads) or 12 lead (limb leads and chest leads)

1. Turn on cardiac monitor and prepare leads for ECG
2. Place leads (4 leads or 12 leads)
3. Record heart rate

ELECTROCARDIOGRAM (ECG)

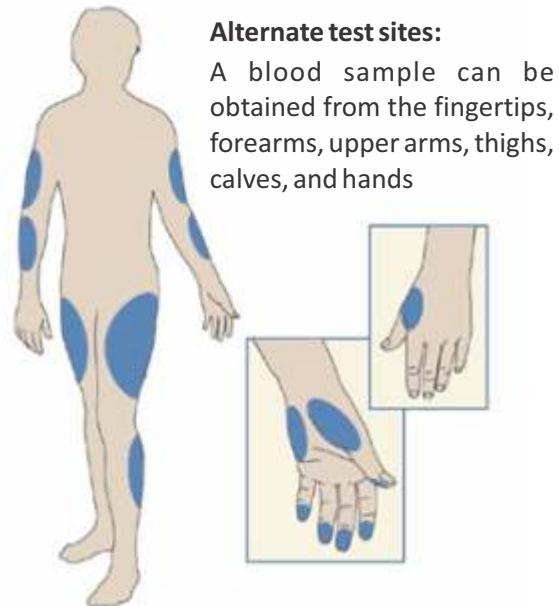
- Records the electrical activity of the heart
- Identifies irregular heart beats, acute myocardial infarction, and presence of cardiac activity
- 12 Lead ECG
 - 4 Limb leads; 6 Chest leads (V1 to V6)

1. Dry patient if sweaty
2. Remove hair with razor if needed
 - a. Place leads on patient
 - b. Ensure good skin contact
3. To improve tracing, ensure patient is not moving
4. Print out or transmit ECG for interpretation

GLUCOSE CHECK (GRBS)

- Determination of blood glucose concentration
- Blood glucose level in mg/dL or mmol/L
- Normal blood glucose levels are 80 mg/dL to 120 mg/dL (4.4 mmol/L to 6.6 mmol/L)

1. Put on gloves
2. Turn on and prepare glucose meter (refer to manual included with glucose meter)
3. Insert test strip
4. Choose blood draw site on side of pad of finger (or **Alternate test sites**)
5. Swab pad of finger with alcohol and allow to dry (or dry with gauze)
6. Pierce finger with lancet
7. Wipe off the initial blood drop
8. Squeeze the area to produce a second blood drop
9. Place end of testing strip into the drop of blood and wait for result
10. Apply firm pressure to puncture site with gauze or bandage
11. Record glucose level



Swab pad of finger with alcohol



Pierce finger with lancet



Squeeze the area to produce a second blood drop



Place end of testing strip into the drop of blood

INTRAVENOUS (IV) ACCESS

- IV (intravenous) catheter/cannula may be inserted into peripheral veins

Procedure

1. Choose size

- Use 18 gauge catheters/cannulas for routine IV access (If possible)
- Use large bore catheters/cannulas (14-18G) for large fluid volumes or unstable patients
- Use age-appropriate catheter/cannula size for pediatric patients

2. Choose number

- Place 2 IVs if at risk for significant volume loss, hypotension, or instability

3. Choose site location

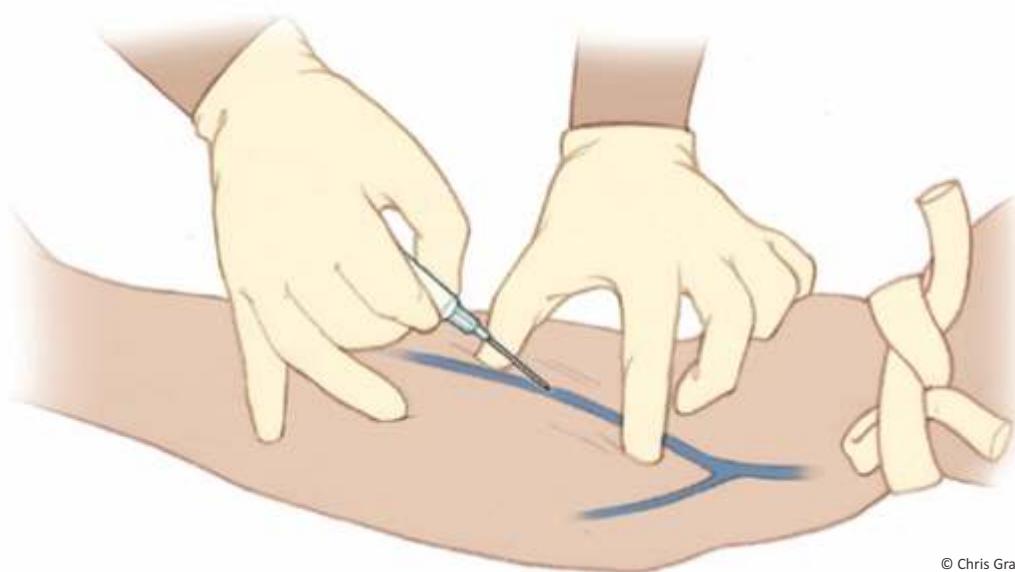
- Avoid extremity with injury, cellulitis/infection, fistula or prior breast operation
- Place large bore IVs in proximal location (e.g., Flush with saline prior to use to ensure adequate cannulation of vein. If observe swelling and pain with flushing, do not use.)

4. Choose fluid or drug to administer

- Fluid challenge for adult patient (NS 500 mL), for pediatric patient (NS 20 mL/kg)
- Ensure medication can be given intravenously prior to administration

5. Document

- Gauge, site, number of attempts, fluid infused, time and rate



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OXYGEN ADMINISTRATION

- Tissues and organs require oxygen to function
- Normal oxygen saturation is $\geq 95\%$ in healthy patients
- Critically ill patients and patients with heart/lung conditions should receive supplemental oxygen
- Provide oxygen to patients with an oxygen saturation $< 95\%$
- Use high flow oxygen (face mask or positive pressure ventilation) in critically ill patients, and in patients with moderate or severe respiratory distress

1. Ensure oxygen source (oxygen cylinder) is delivering oxygen
2. Attach oxygen tubing to the oxygen source
3. Turn on oxygen to desired level
4. Monitor the patient's oxygen saturation with **Pulse oximetry**

Mild respiratory distress: Able to speak normally, rapid breathing, oxygen saturation $> 90\%$	Moderate respiratory distress: Unable to speak full sentences, difficulty breathing, oxygen saturation $\leq 90\%$	Severe respiratory distress: Hypoxia, tachypnea, cyanosis, grunting, inability to speak, retractions
---	---	---

Nasal cannula <ul style="list-style-type: none"> • Set to 1 to 6 L/minute • Delivers 24% to 44% O₂ 	Face mask <ul style="list-style-type: none"> • Set to 6 to 10 L/min • Delivers up to 60% O₂ Non-rebreather mask (NRBM) <ul style="list-style-type: none"> • Set to 10 to 15 L/min • Delivers up to 90% O₂ 	Positive pressure ventilation <ul style="list-style-type: none"> • BMV • Intubation and ventilation • Set to 15 L/min • Delivers up to 100% O₂
--	---	--

- Adjust level oxygen delivery to ensure oxygen saturation is $\geq 94\%$
- In COPD patients titrate oxygen to achieve goal oxygen saturation of 90-92%

PULSE OXIMETRY

- Monitors patient's oxygen level, given as a percentage of hemoglobin saturated with oxygen
- Measure in all critically-ill patients and patients with suspected cardiac or respiratory disease
- Accuracy of oximetry is affected by poor circulation, cool temperature, and medical conditions (such as cyanide toxicity, carbon monoxide poisoning, or methemoglobinemia)

1. Turn on machine
2. Clean finger and remove nail polish
3. Place probe on index finger or ring finger
 - May place on toe or foot for pediatric patients
 - Consider placement on ear lobe if poor finger tracing
4. Instruct patient not to move, then wait for oxygen saturation reading
 - Movement will prevent an accurate reading
5. Wait for reading to appear and record results

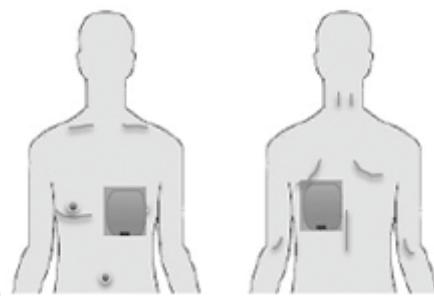


TRANSCUTANEOUS PACING

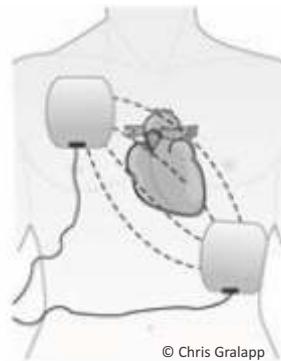
- Electrically stimulates the heart through external electrode pads
- Used for patients with an abnormally slow heart rate (HR <50) with signs of shock (refer to Bradycardia protocol for Indications) Refer Page 24
- Definitions
 - **Demand (synchronous) mode:** Pacemaker paces the heart only when the heart rate falls below a set level
 - **Fixed (asynchronous) mode:** Pacemaker paces the heart at a set rate regardless of the patient's heart rate; use ONLY if pacer cannot sense the heart rate as it can cause ventricular fibrillation

Transcutaneous pacing (TCP) protocol

1. Position patient in supine position
2. Dry patient if sweaty
3. Remove hair with razor if needed
4. Place pads on patient as shown in diagram (Front/back preferred
Anterior/apex optional)
 - a. Press firmly onto skin, ensuring gapless contact
5. Connect the pads to the monitor
6. Activate Pacing function on monitor
 - a. Leads aVL or V1 recommended for monitoring
7. Select Demand mode
 - a. Adjust the rate to 80 pulses per minute
8. Capture the heart rate
 - a. Start the pacer at 0 mA
 - b. Increase the output by 10 mA increments until pacer spikes are visible in front of each QRS complex-**Capture (see Figure)**
 - c. Check pulse to ensure perfusing rhythm
 - i. Pulse should be 80 beats per minute
 - d. Decrease output until capture is lost and then increase by 10 milliampere
9. Re-evaluate the patient every 5 minutes while pacing
- Consider analgesic and sedative for patient comfort; use with caution if SBP <90
 - **Tramadol 25-50 mg IV** as needed for pain
 - **Midazolam 1-2 mg IV** every 5 minutes as needed for sedation (up to 6 mg)



Front/ back pad
placement standard



© Chris Gralapp
Anterior/apex pad placement
optional



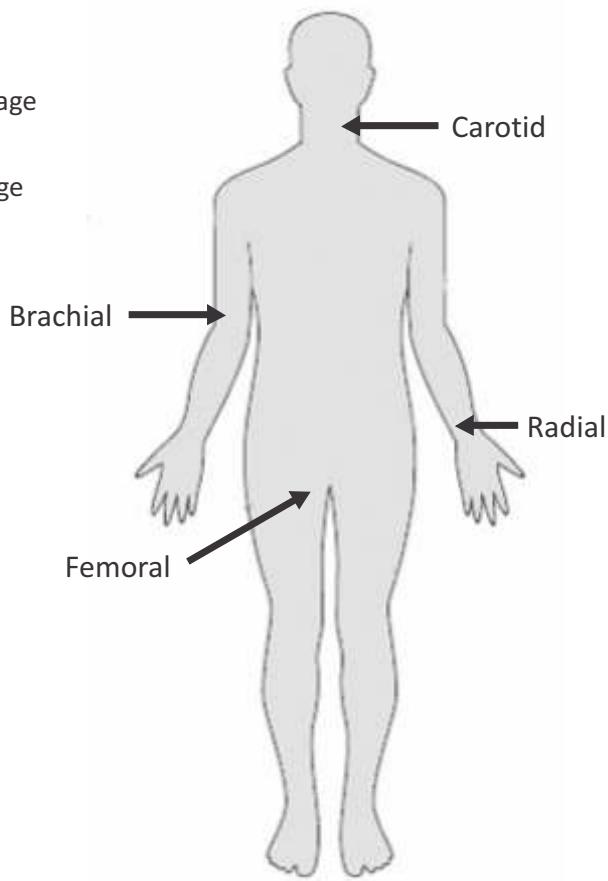
Capture: pacer spike in front of
each QRS complex

VITAL SIGNS

Pulse

- Definitions
 - Bradycardia:** A slow heart rate for the person's age
 - See *Bradycardia protocol (Refer page 24)*
 - Tachycardia:** A fast heart rate for the person's age
 - See *Tachycardia protocol (Refer page 82)*
- If unresponsive
 - Assess carotid pulse first
- If responsive
 - Assess radial pulse first
 - Age <2 years old
 - Assess brachial pulse
- Record rate, rhythm, quality

Normal Heart Rate	
Newborn-3 months	85-205 bpm
3 months-2 years	100-190 bpm
2-10 years old	60-140 bpm
>10 years-Adult	60-100 bpm



Respiratory Rate

- Definitions
 - Tachypnea:** Breathing too fast for a person's age
 - Bradypnea:** Breathing too slow for a person's age
 - Dyspnea:** Difficulty breathing
 - Apnea:** Not breathing
- Record rate, rhythm and quality
- See *Respiratory distress protocol (Refer page 64)*

Normal Respiratory Rate	
Infant (<12 months)	30-60 breaths/min
Toddler (1-2 years)	24-40 breaths/min
Preschool (3-4 years)	24-34 breaths/min
School aged (5-10 years)	18-30 breaths/min
Adolescent-Adult (≥ 11 years)	12-16 breaths/min

Temperature

- Definitions
 - Normal temperature: 37°C (98.6°F)
 - Hypothermia: <36°C (96.8°F)
 - See **Hypothermia protocol (Refer page 50)**
 - Hyperthermia: >37.8°C (100°F)
 - See **Heat illness protocol (Refer page 44)**
- Use thermometer axillary/temporal/tympanic for all, as it is less infectious risk

Blood Pressure

- Definitions
 - Hypertensive: Blood pressure that is high for a person's age or medical condition
 - See **Hypertensive emergency protocol (Refer page 46)**
 - See **Preeclampsia/eclampsia protocol (Refer page 62)** if pregnant
 - Hypotensive: Blood pressure that is low for a person's age
 - See **Shock protocol (Refer page 72)**
- Use age-appropriate sized cuff
 - Adult (standard)
 - Pediatric
- Record systolic and diastolic blood pressure

Degrees of Hypertension (mmHg)	
Pre-hypertension	SBP >120-140
Hypertension	SBP >140 (DBP >90)
Severe	Any hypertension with end organ damage

Definition of Hypotension by age (mmHg)	
0-28 days	SBP <60
1-12 months	SBP <70
Children 1-10 yrs	SBP <70 + (age x 2)
>10 yrs-Adult	SBP <90

Oxygen saturation

- Definition
 - Percent of hemoglobin saturated with oxygen
 - Normal: ≥95%
- See **Pulse oximetry protocol (Refer page 10)**

References

- Topjian, A. A., et al. (2020). Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation, 142 (16_suppl_2), S469–S523.

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ABDOMINAL PAIN

Definition

- Pain between the ribs and the pelvis

Key Points

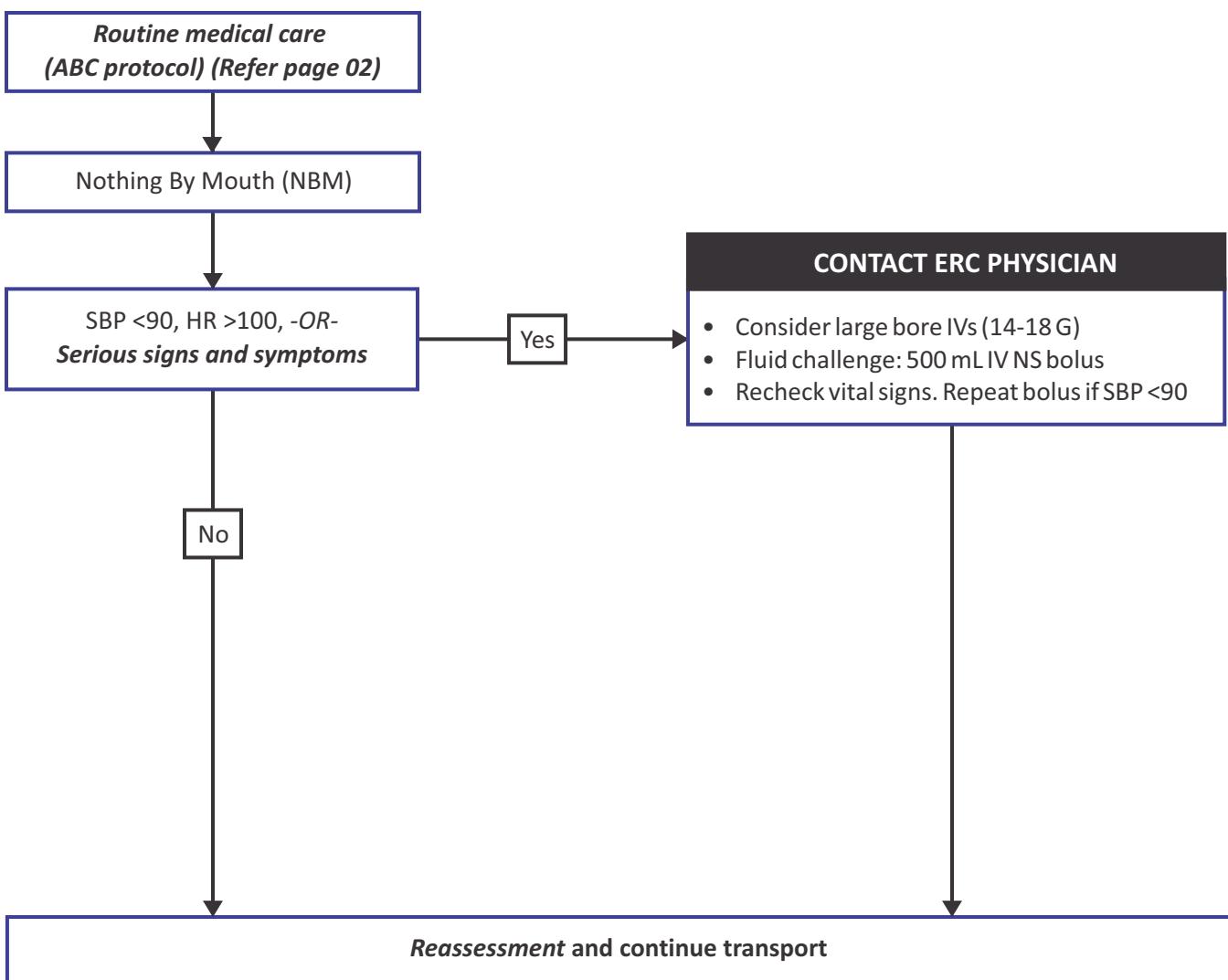
- History is important to determine cause of pain
- Obtain: Past medical history, medications, last menstrual period in females
- Upper abdominal pain may be cardiac pain (AMI or angina)

Differential diagnosis

- See figure on following page for complete differential diagnosis

Serious signs and symptoms

- | | | |
|-----------------|-------------------------|--|
| • Rigid abdomen | • Severe pain | • Abdominal distension |
| • Pregnancy | • Vomiting | • Altered mental status |
| • Sweating | • Fever | • Hematemesis (blood in vomit) |
| • Pale/pallor | • Dizziness (giddiness) | • Blood in stool (melena/hematochezia) |



ERC Physician

Key points

- If persistent hypotension consider hemorrhagic or septic shock (see **Shock Protocol**) (**Refer page 72**)
 - Consider 2nd large bore IV

Prehospital management options

- Pain control**
 - Paracetamol 1000 mg IV/IM**
 - Tramadol 25-50 mg IV** as needed for severe pain; do not give if SBP <90 or RR <12

Prolonged transport or in hospital management options

- Continue resuscitation with repeat 500 mL IV NS bolus; may repeat as needed to keep SBP >90

Pediatrics

Prehospital management options

- Paracetamol 15 mg/kg IV** to maximum of 1000 mg
- 20 mL/kg IV NS bolus up to 500 mL

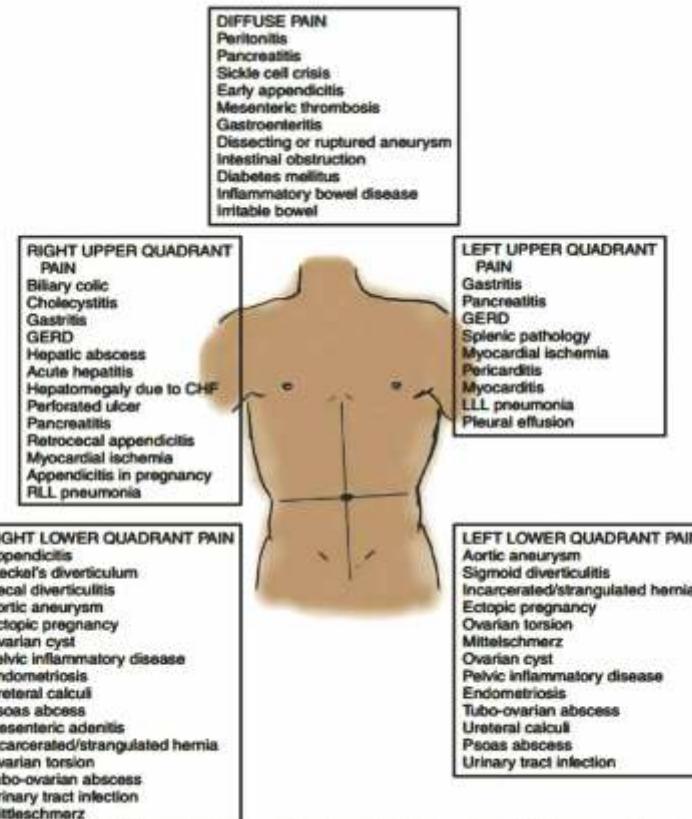


Fig. 23.1 Differential Diagnosis of Acute Abdominal Pain by Location. CHF, Congestive heart failure; GERD, gastroesophageal reflux disease; LLL, left lower lobe; RLL, right lower lobe.

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- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.
- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.

AIRWAY OBSTRUCTION

Definition

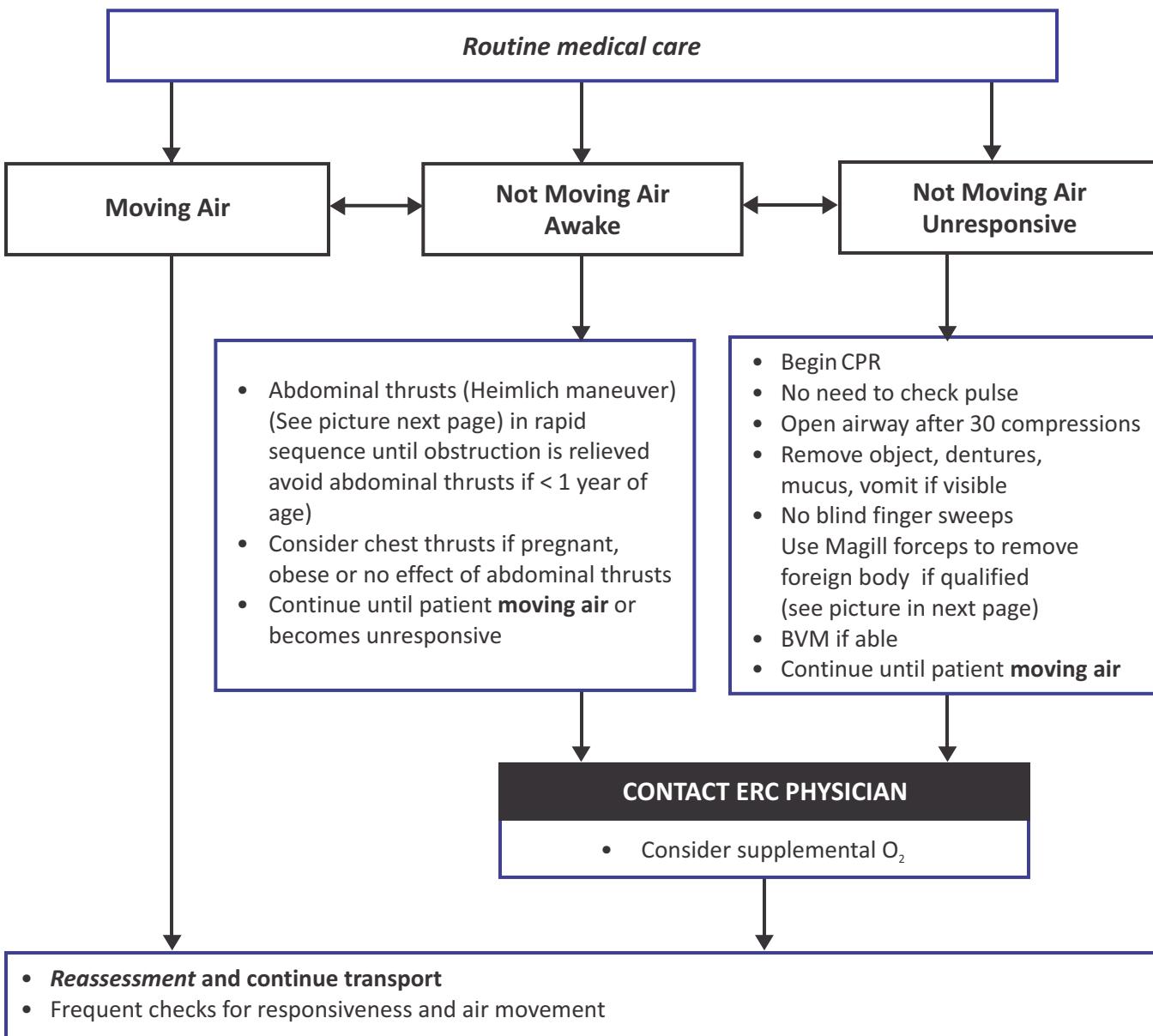
- Airway obstruction is a true emergency in which airflow into the lungs is blocked

Key points

- May be mild or severe
- Only intervene if patient is not moving air

Serious signs and symptoms

- | | | |
|----------------------|-------------------------|-------------------------|
| • No air movement | • Grasps at throat | • Respiratory distress |
| • Inability to speak | • Cyanosis (turns blue) | • Loss of consciousness |
| • Silent cough | | |



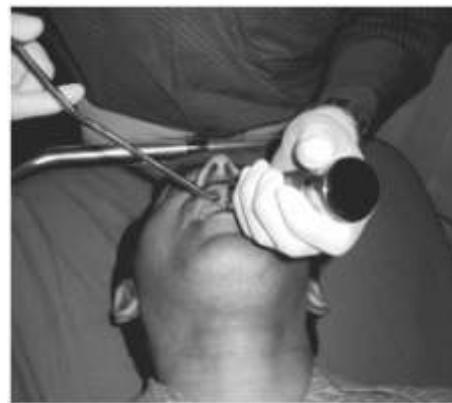
ERC Physician

Key points

- Important to distinguish Foreign-Body Airway Obstruction (FBAO) from other emergencies like syncope, AMI, seizure
- Blind finger sweeps are not recommended at any age; may cause further harm by pushing object further into upper airway

Pre hospital management options

- If obstruction persists, visualize with laryngoscope and remove visible foreign body with Magill forceps (see picture below), then attempt to ventilate



Pediatrics

Prehospital Management Options

- Infant (<1 year old): cycles of 5 back blows/slaps followed by 5 chest compressions until object is expelled or patient becomes unresponsive
 - NO abdominal thrusts as they can damage an infant's large and unprotected liver



Back blows/slaps in infant airway obstruction



Chest compressions in infant airway obstruction

References

- Topjian, A. A., et al. (2020). Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation*, 142(16_suppl_2), S469–S523.
- A Practical Guide to Pediatric Emergency Medicine: Caring for Children in the Emergency Department, ed. N. Ewen Amieva-Wang. Cambridge University Press 2011.

ALLERGIC REACTION/ANAPHYLAXIS

Definition

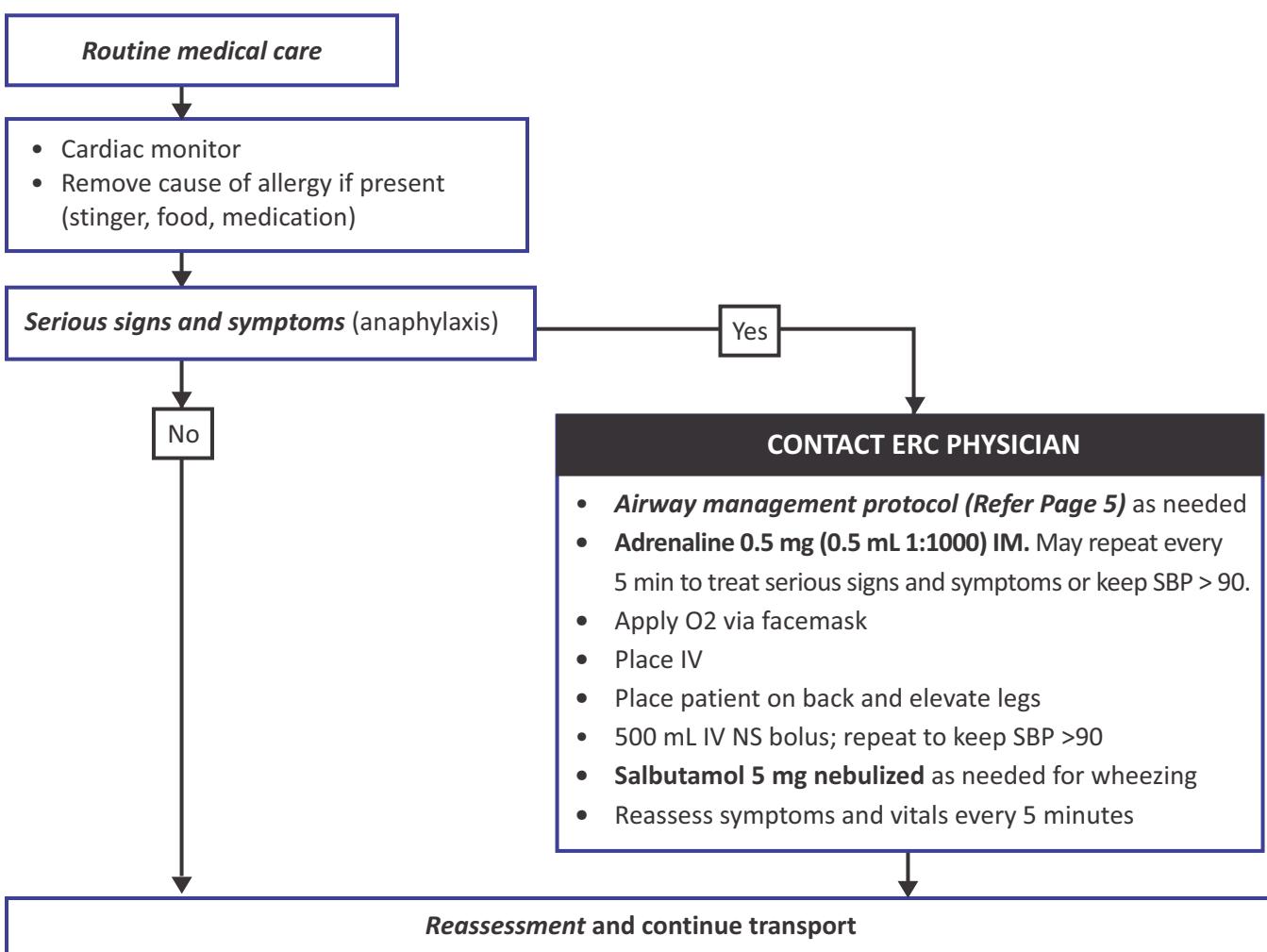
- Reaction of the immune system to food, medication, or venom etc.
- Anaphylaxis is a potentially life-threatening allergic reaction.

Key Points

- Mild signs and symptoms:** Local (limited to one part of the body)
 - Redness
 - Rash
 - Swelling
 - Itching
- Serious signs and symptoms (anaphylaxis):** Exposure to potential allergen + airway, breathing or circulation issue or 2 of the following
 - Acute onset abdominal pain/nausea/vomiting after exposure
 - SBP < 90 adults {or below age based cutoffs for pediatric patients (**Refer Page 12**)}
 - Shock
 - Dizziness/giddiness
 - Swelling head, face, or oropharynx
 - Wheezing
 - Altered mental status
 - Upper airway obstruction
 - Shortness of breath or difficult breathing

Differential Diagnosis

- Asthma
- Toxin exposure
- Poisoning
- Airway obstruction
- Infection



ERC Physician

Key points

- Adrenaline and IV fluids are the most important interventions in anaphylaxis
 - Adrenaline can cause Tachycardia & Hypertension
- Prehospital management options
 - For anaphylactic shock
 - Repeat 500 mL IV NS bolus to keep SBP >90
 - Repeat Adrenaline 0.5 mg (0.5 mL 1:1000) IM (at anterolateral aspect of thigh) every 5 min as needed
 - **Airway management protocol (Refer page 05)** if worsening respiratory distress
 - Steroids are not useful in acute allergy but can prevent recurrent or prolonged anaphylaxis
- Prolonged transport or in hospital management options
 - Consider Adrenaline IV at 1-10 mcg/min (infusion by pump) to keep SBP >90

Pediatrics

Prehospital Management Options

- Management is similar to adults with following pediatric doses:
- 20 mL/kg IV NS bolus

• Child >12 years	0.5mg (0.5ml of 1:1000) IM
• Child 6-12 years	0.3mg (0.3ml of 1:1000) IM
• Child 6 months - 6 years	0.15mg (0.15ml of 1:1000) IM
• Child < 6 months	0.1mg (0.1ml of 1:1000) IM

- Salbutamol 2.5 mg nebulized

References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.
- Golden DBK, Wang J, Waserman S, et al. Anaphylaxis: A 2023 Practice Parameter Update. Ann Allergy Asthma Immunol. 2024;132(2):124–176. doi:10.1016/j.anai.2023.09.015

ALTERED MENTAL STATUS (AMS)

Key points

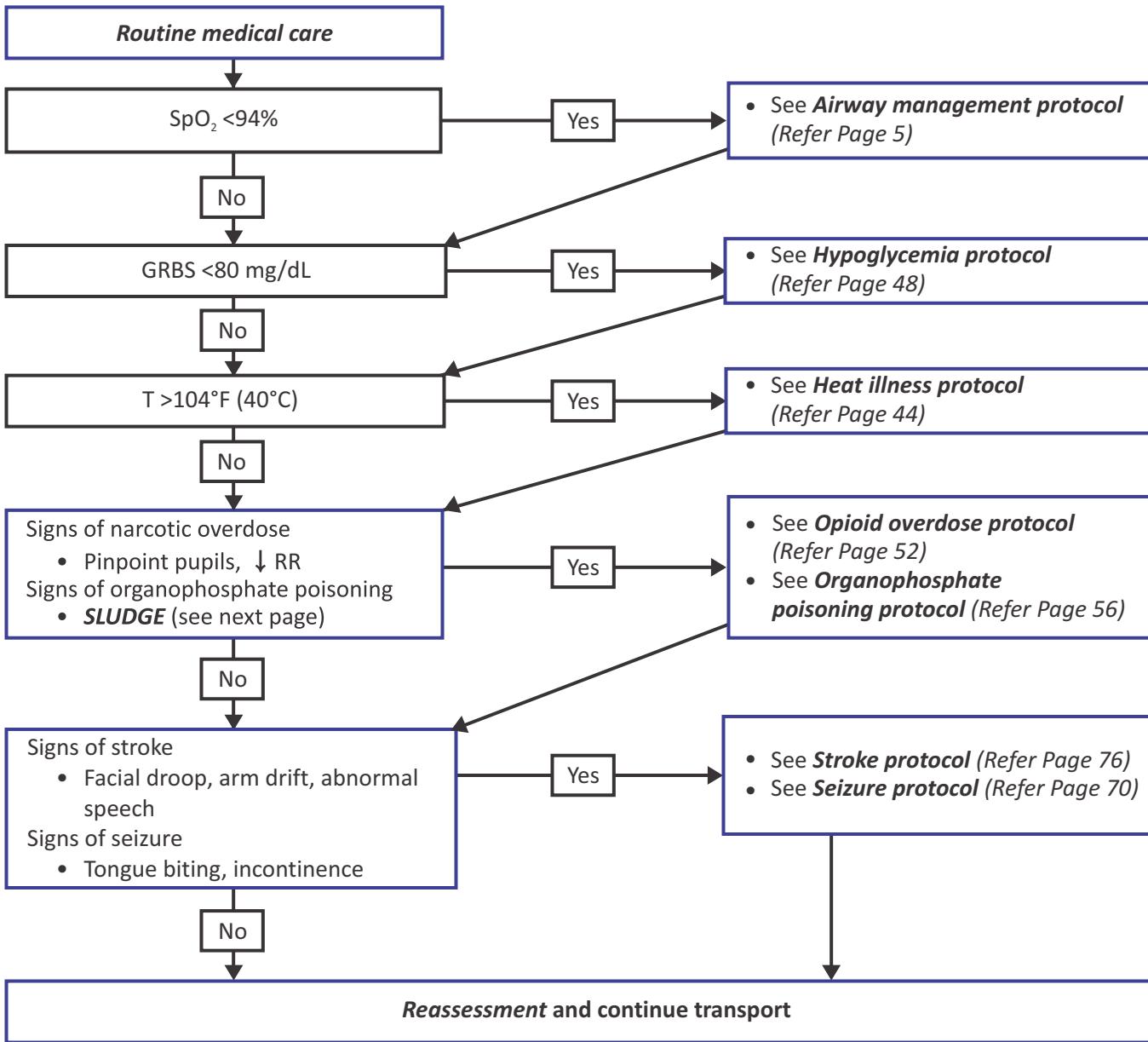
- Consider trauma and spinal immobilization
- Consider on scene evaluation for potential exposures/ingestants is critical)
- Always keep patient NBM

Differential diagnosis

- | | | | |
|--------------------------------|---------------|------------------|-------------|
| • Intoxication (Alcohol/Drugs) | • Hypoxemia | • Hypoglycemia | • DKA |
| • Trauma/Toxins | • Psychosis | • Shock | • Infection |
| • Electrolyte abnormalities | • Medications | • Stroke/Seizure | |

Serious signs and symptoms

- | | | |
|---------------|-----------------------------------|------------------|
| • Fever | • Respiratory distress/depression | • Focal weakness |
| • Trauma | • Airway compromise | |
| • Diaphoresis | • Seizures | |



ERC Physician

Prehospital Management Options

- In patients with altered mental status, consider the following:
 - Oxygen for hypoxia
 - **Dextrose 25 g IV** for hypoglycemia
 - Temperature control (refer to hypothermia protocol) (*Refer page 50*)
 - **Naloxone (Narcan) 0.2-2 mg IV** in adults (0.1 mg/kg IV in pediatrics) for suspected narcotic overdose
 - Hydration
 - Thorough physical exam
- **Glucose**
 - GRBS >80: Consider alcohol, other toxic ingestions, drugs, trauma, stroke, seizures
- **Stroke (refer to stroke protocol)** (*Refer page 72*)
 - Airway management
 - Transfer to stroke center

SLUDGE (findings in organophosphate poisoning)

- Salivation, Lacrimation, Urination, Diarrhea, GI upset, Emesis

A The patient is awake.

V The patient responds to verbal stimulation.

P The patient responds to painful stimulation.

U The patient is completely unresponsive.

Glasgow Coma Scale (GCS)

Eye Opening	Verbal Response	Motor Response
4 Spontaneous	5 Oriented	6 Obeys commands
3 To voice	4 Confused	5 Localizes
2 To pain	3 Words	4 Withdraws
1 None	2 Incomprehensible sounds	3 Decorticate posturing (Flexion)
	1 None	2 Decerebrate posturing (Extension)
		1 None

Pediatrics

Key points

- Usually present with treatable causes of AMS: toxin exposure is most common
- Early detection and prompt treatment (antidotes) are critical
- Do not perform gut decontamination
- Other causes of AMS: infection, trauma, metabolic derangements and child abuse

References

- Walls RM (ed). Rosen's Emergency Medicine: Concepts and Clinical Practice, 10th ed. Mosby, St. Louis, MO, 2023.
- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.

BEHAVIORAL EMERGENCIES

Definition

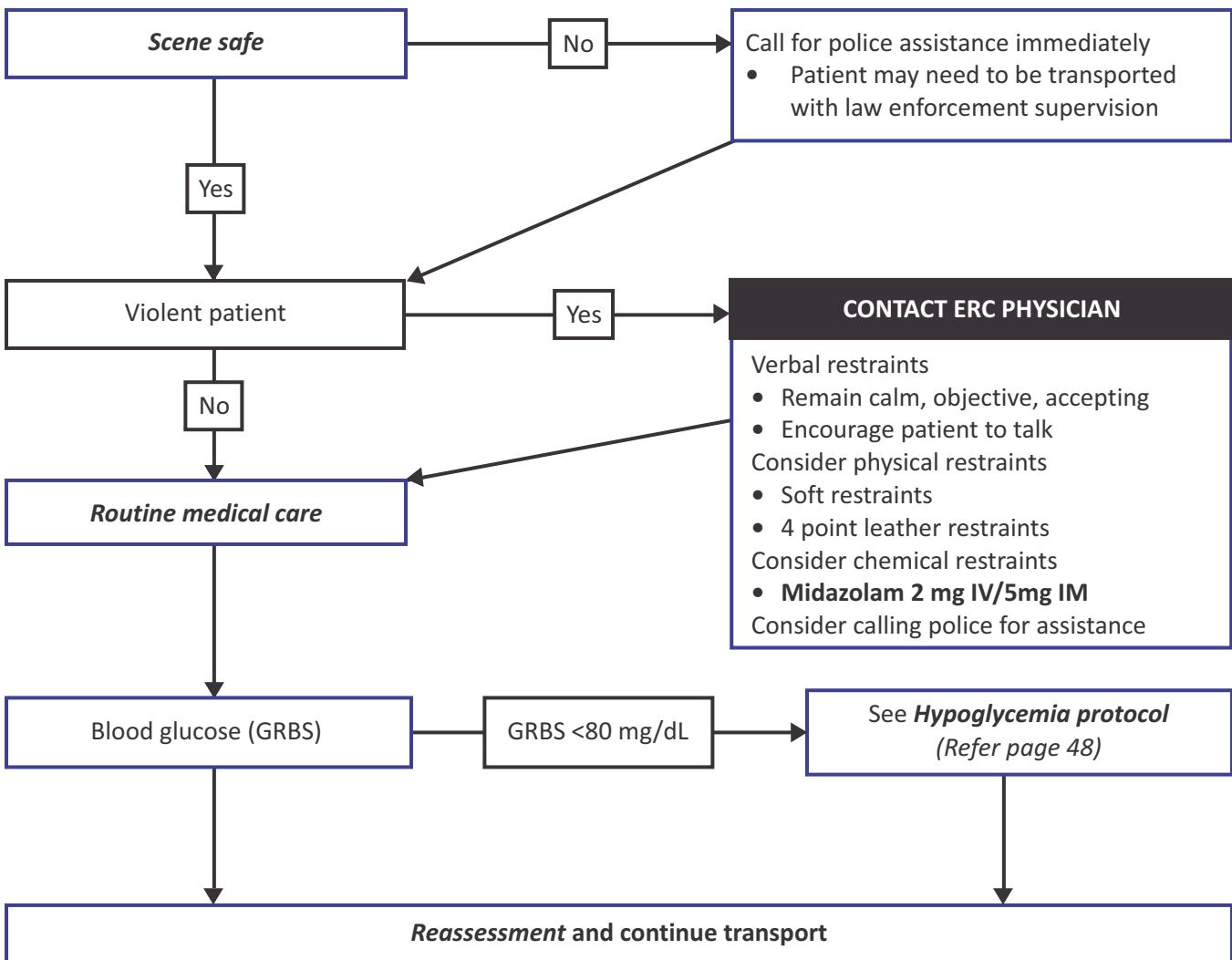
- A problem of mood or thought that interferes with daily living
- Deranged, unbalanced behavior

Key points

- **ALWAYS** consider other medical causes
- With potentially violent patients, ensure safety of EMS providers/staff
- Obtain verbal consent from family
- For confusion or decreased level of consciousness, see **Altered mental status protocol** (Refer page 20)

Signs and symptoms

- Delusions, false perceptions
- Hallucinations
- Restlessness
- Anxiety
- Behaving abnormally



ERC Physician

Key points

- Consider non-behavioral (medical) causes including toxin ingestions, infections, neurologic disease, cardiovascular disorders, endocrine disorders, metabolic disorders, or carbon monoxide

Prehospital management options

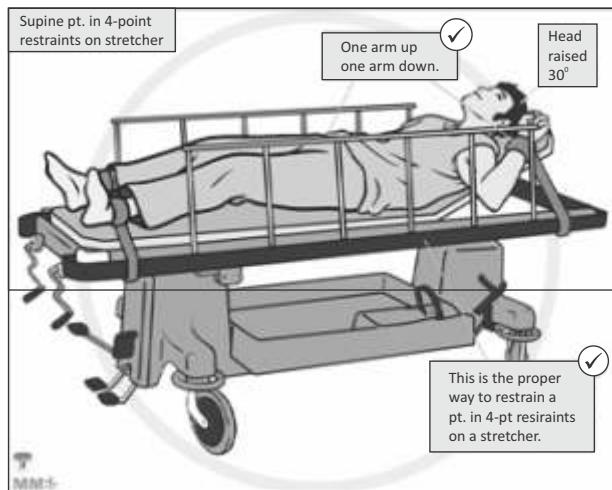
- Chemical restraints if other measures fail
 - Midazolam 2 mg IV/5 mg IM**

Scene safety

- Assess for signs of potentially dangerous actions:
 - Verbal abuse of emergency personnel or others
 - Violent actions against emergency personnel or others
 - Planned or actual suicide attempt
 - Threats against self or others
 - Presence of weapons or materials that could potentially be used as weapons

Special Considerations

- Take all threats seriously
- Make every effort to keep at least one route of escape for providers from patient. Do not allow patient to corner or isolate individuals.
- Keep a safe distance from all potential weapons
- Do not argue with patient
- Remain calm, objective, and accepting
- Make slow and deliberate movements



References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY 2012.
- Molson Medical Informatics Project M. Proper Technique for 4-Point Restraint on Stretcher. MedEdPORTAL; 2009.

BRADYCARDIA

Definition

- Heart rate <50 bpm

Key points

- Only treat bradycardia with **Serious signs and symptoms**

Differential diagnosis

- Acute myocardial infarction
- 2nd/3rd degree heart block
- Medications (calcium channel blockers, beta blockers, digoxin)
- Organophosphate poisoning
- Hypothyroidism
- Elevated potassium

Serious signs and symptoms

- | | | |
|-----------------------|--|--------------------------|
| • Chest pain | • Syncope (fainting) | • Altered mental status |
| • SBP <90 | • Symptoms of pulmonary edema (See box on next page) | • Cool/clammy skin |
| • Shortness of breath | • Dizziness/giddiness | • Cap refill > 3 seconds |

Routine medical care

- Cardiac monitor/ECG
- IV access

HR <50 with **Serious signs and symptoms**

No

Yes

CONTACT ERC PHYSICIAN

- Atropine 1 mg IV; may repeat every 3-5 min as needed to increase heart rate more than 60 or until resolution of serious signs and symptoms (up to a total of 3 mg)
- 500 mL IV NS bolus if SBP <90; **DO NOT** give bolus if **Signs of Pulmonary edema (see next page)**

Continued HR <50 with **Serious signs and symptoms**

No

Yes

- **Transcutaneous pacing (Refer page 11)**
-OR-
- **Dopamine 5-20 mcg/kg/min IV** to keep SBP >90 (infusion by pump)
-OR-
- **Adrenaline 2-10 mcg/min IV** to keep SBP >90 (infusion by pump)
-OR-
- **Consider Adrenaline IV 10 mcg stat bolus every 1 minute**
If patient becomes unconscious, check pulse and if absent start CPR
(see CPR Protocol, (Refer page 26))

Reassessment and continue transport

ERC Physician

Prehospital management options

- See **Transcutaneous pacing protocol** (Refer page 11)
 - Consider pain control and sedation
 - **Tramadol 25-50 mg IV** as needed for pain
AND
 - **Midazolam 1-2 mg IV** every 5-10 min as needed for sedation
 - If transcutaneous pacing capture but continued **Serious signs and symptoms** consider increasing rate by 10 bpm to a maximum of 100 bpm
- Repeat 500 mL IV NS bolus to keep SBP >90; **DO NOT** give bolus if **Signs of Pulmonary edema**
- Beta blocker overdose suspected
 - Consider **Glucagon 5 mg IV** over 1 min; if no response in 10 min consider repeating x 1
 - See **Poisoning protocol** (Refer page 58)
- Calcium channel blocker overdose suspected
 - Consider **Calcium gluconate (10% solution) 30-60 mL IV** over 10 min
 - Consider **Glucagon 5 mg IV** over 1 min; if no response in 10 min consider repeating x 1 if available
 - See **Poisoning protocol** (Refer page 58)

Signs of Pulmonary edema: difficulty breathing, frothy sputum, SpO₂ <94%, crepitations, RR >30

Pediatrics

Key points

- The most common causes of symptomatic bradycardia in children are hypoxia and medication/poison ingestions
- In young children consider initiating CPR if HR <60 with signs of shock
- Administer adrenaline or atropine prior to transcutaneous pacing

Bradycardia

< 1 Year	<100 bpm
1-10 years old	<70 bpm
>10 years-Adult	<60 bpm

Prehospital management options

- **Adrenaline 0.01 mg/kg IV/IO** (max single dose 1 mg) every 3-5 min
- **Atropine 0.02 mg/kg IV/IO** (max single dose 0.5 mg) every 3-5 min up to 2 doses (minimum dose of 0.1 mg)
- **Glucagon 0.05 mg/kg IV** up to 1 mg
- **Calcium gluconate (10% solution) 20 mg/kg IV**

Prolonged transport or in hospital management options

- **Adrenaline 2-10 mcg/min IV** (infusion by pump)
- **Dopamine 2-10 mcg/kg/min IV** (infusion by pump)

References

- Panchal AR, Bartos JA, Cabañas JG, et al. Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S366–S468.
- Topjian AA, Raymond TT, Atkins D, et al. Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S469–S523.

CARDIAC ARREST

Definition

Unresponsive patient without palpable femoral or carotid pulses & no breathing

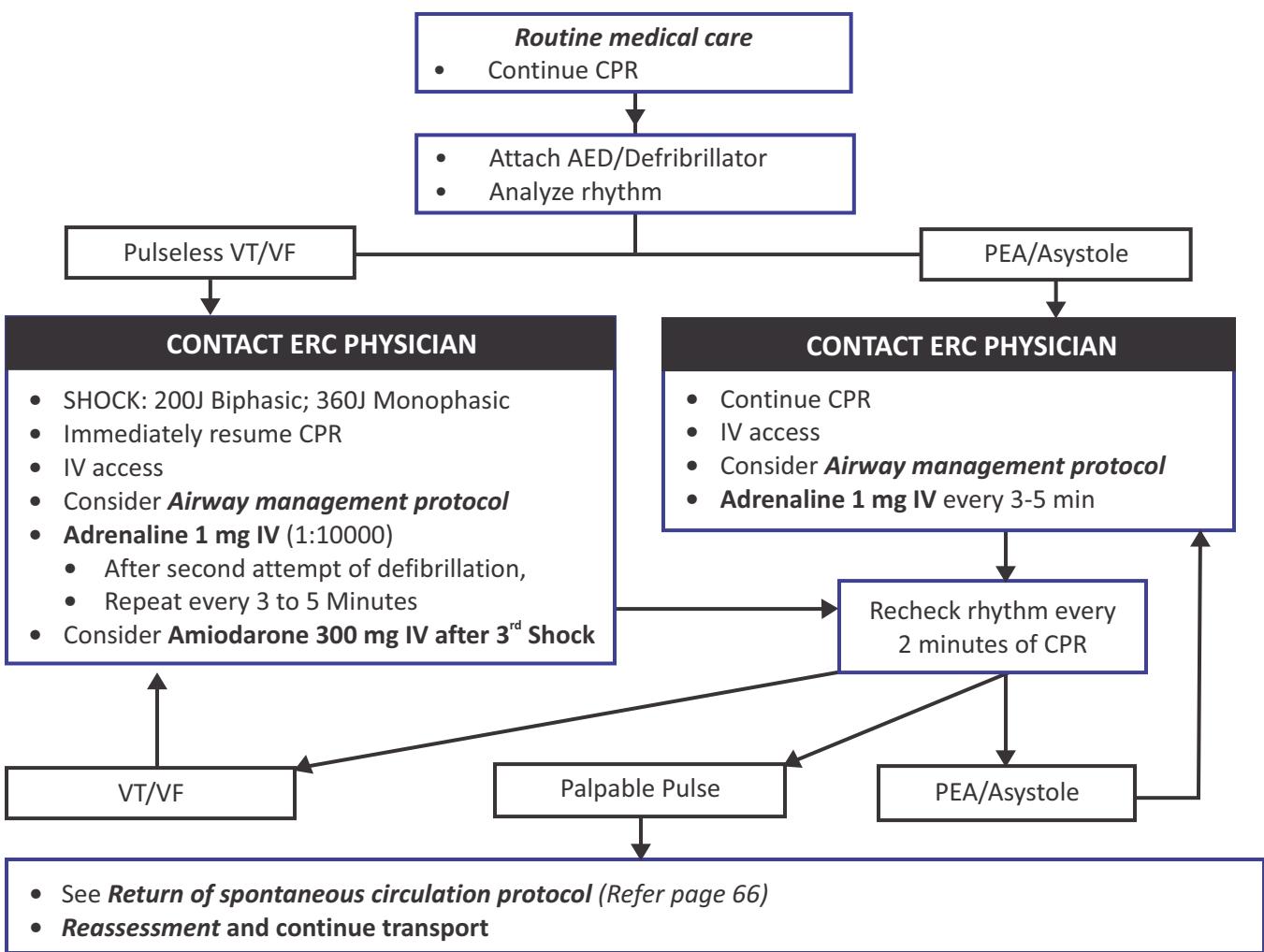
- **Shockable rhythms:** cardiac conditions which may improve with defibrillation
 - **Ventricular tachycardia (VT):** tachycardia from ventricular source with rate greater than 120 beats per minute with wide QRS (>0.12) complexes Refer page 68
 - **Ventricular fibrillation (VF):** disorganized electrical rhythm leading to uncoordinated contraction of the cardiac muscle
- **NonShockable rhythms:**
 - **Pulseless electric activity (PEA):** organized cardiac electrical activity without pulses
 - **Asystole:** no electrical activity on ECG/monitor

Key points

- High quality CPR (100-120 compressions/min, 5-6 cm in depth and allow complete chest recoil) will improve survival rate
- 30 compressions : 2 breaths; after intubation, continuous compressions and 1 breath every 6 secs delivered at 10 breaths/min
- Minimize interruptions of chest compressions to maximize survival (<10 seconds)
- Use cardiac monitor or AED to check for shockable rhythms

Differential diagnosis

- See following page for **Reversible causes of cardiac arrest**



ERC Physician

Key points

- Ensure high quality CPR is being performed
 - Push hard & fast
 - Allow complete chest recoil
 - Minimize interruptions to <10 sec and
 - Avoid hyper ventilation. Give 1 breath every 6 seconds with advanced airway
- Patients in cardiac arrest require rapid transport to appropriate medical facility
- Review **Reversible causes of cardiac arrest**

Prehospital management options

- If IV access is difficult, consider intraosseous access (IO)
- **Amiodarone 150 mg IV** may be repeated if unresponsive to the initial dose after 5th shock

Reversible causes of cardiac arrest

- | | | | |
|----------------------------|----------------------|------------------------------|-------------|
| • Hypovolemia | • Hypo-/Hyperkalemia | • Tension pneumothorax | • Toxins |
| • Hypoxia | • Hypothermia | • Thrombosis, pulmonary (PE) | • Tamponade |
| • Hydrogen ions (acidosis) | | • Thrombosis, cardiac (AMI) | |

Pediatrics

Key points

- Pediatric BLS focuses on CABs
 - One rescuer: 30 compressions to 2 breaths
 - Two rescuers: 15 compressions to 2 breaths
- Chest compression should be $\geq 1/3$ the diameter of the chest (4 cm for infants, 5 cm for children)
- 100-120 compressions per minute allowing for full recoil of chest wall
- If HR <60 bpm with signs of shock unresponsive to oxygenation and ventilation, then start chest compressions
- **DO NOT** hyperventilate or overinflate
 - Ventilation rate
 - 1 breath every 2-3 sec at 20-30 breaths per minute (advanced airway, pulseless) -OR-
 - 1 breath every 2-3 sec at 20-30 breaths per minute (pulse present)
 - Give breath over 1 second (only enough volume to see the chest rise)

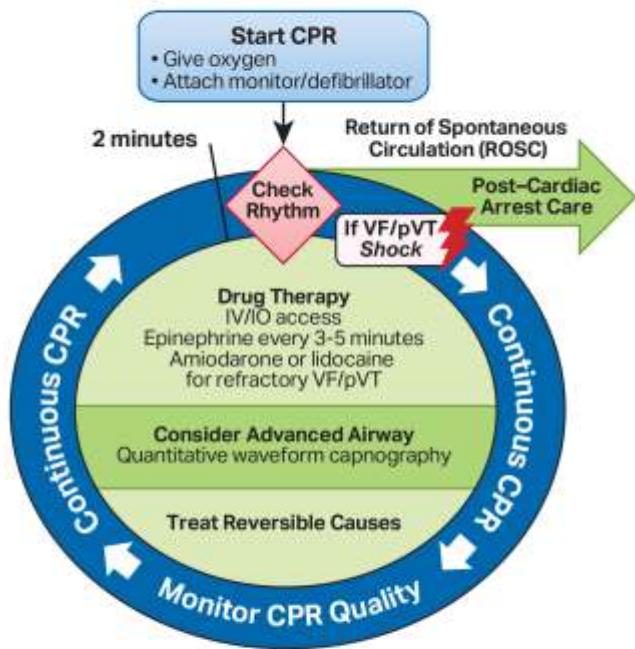
Prehospital management options

- **Adrenaline 0.01 mg/kg IV** up to 1 mg every 3-5 min
- **Amiodarone 5 mg/kg IV** up to 300 mg; consider after third attempt at defibrillation
- Defibrillation 2-4 J/kg subsequent shocks can be increased by 2J/Kg i.e., 6,8 maximum 10 J/Kg or adult dose with monophasic or biphasic

References

- Panchal AR, et al. Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020 Oct 20;142(16_suppl_2):S366-S468.
- Topjian AA, et al. Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020 Oct 20;142(16_suppl_2):S469-S523.

Adult Cardiac Arrest Circular Algorithm



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.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 30:2 compression-ventilation ratio.
- Quantitative waveform capnography
 - If PETCO₂ is low or decreasing, reassess 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.
or
- Lidocaine IV/IO dose:** First dose: 1-1.5 mg/kg. Second dose: 0.5-0.75 mg/kg.

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)

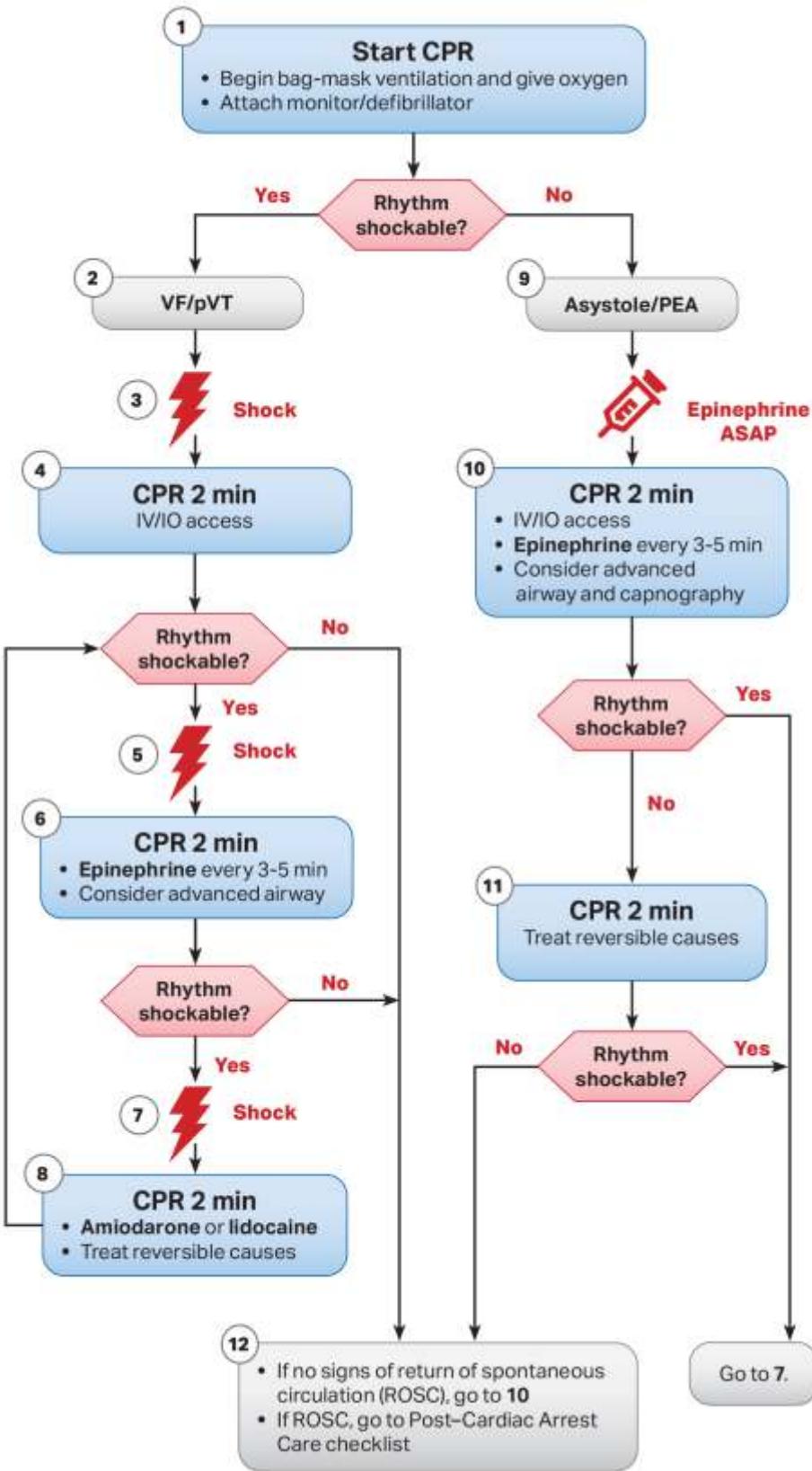
- Pulse and blood pressure
- Abrupt sustained increase in PETCO₂ (typically ≥40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- | | |
|--|---|
| <ul style="list-style-type: none"> Hypovolemia Hypoxia Hydrogen ion (acidosis) Hypo-/hyperkalemia Hypothermia | <ul style="list-style-type: none"> Tension pneumothorax Tamponade, cardiac Toxins Thrombosis, pulmonary Thrombosis, coronary |
|--|---|

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Pediatric Cardiac Arrest Algorithm



CPR Quality

- Push hard ($\geq\frac{1}{2}$ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Change compressor every 2 minutes, or sooner if fatigued
- If no advanced airway, 15:2 compression-ventilation ratio
- If advanced airway, provide continuous compressions and give a breath every 2-3 seconds

Shock Energy for Defibrillation

- First shock 2 J/kg
- Second shock 4 J/kg
- Subsequent shocks ≥ 4 J/kg, maximum 10 J/kg or adult dose

Drug Therapy

- Epinephrine IV/IO dose:** 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration). Max dose 1 mg. Repeat every 3-5 minutes. If no IV/IO access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration).
- Amiodarone IV/IO dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 3 total doses for refractory VF/pulseless VT or
- Lidocaine IV/IO dose:** Initial: 1 mg/kg loading dose

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement

Reversible Causes

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

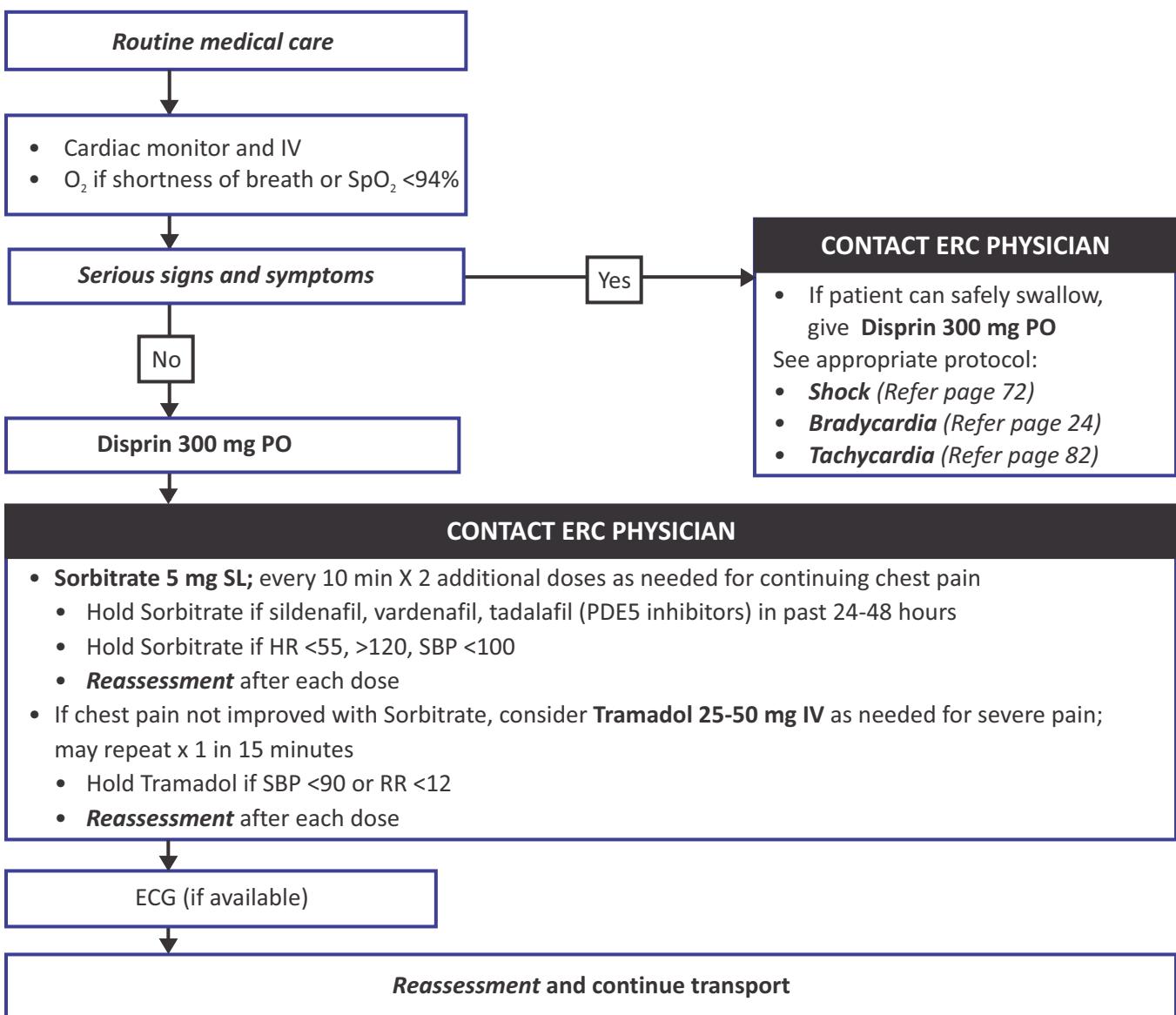
CHEST PAIN

Key points

- Chest pain due to ACS is classically heaviness; may radiate to jaw, arms or back. Women may have different symptoms such as SOB, back pain or jaw pain primarily.
- Associated symptoms-nausea, shortness of breath, diaphoresis, giddiness, palpitations
- Cardiac risk factors-smoking, diabetes, family history, hypertension, elevated cholesterol
- Most deaths from AMI are due to ventricular dysrhythmias

Differential diagnosis

- | | | |
|-----------------------------------|------------------------------|---------------------------|
| • Acute coronary syndrome | • Aortic dissection | • Pericarditis |
| • Pulmonary embolus | • Pneumothorax | • Gastroesophageal reflux |
| Serious signs and symptoms | Altered mental status | Cool, moist skin |
| • Pulse <50 or >120 | • Severe SOB | • Severe or tearing pain |
| • SBP <90 or >180 | | |



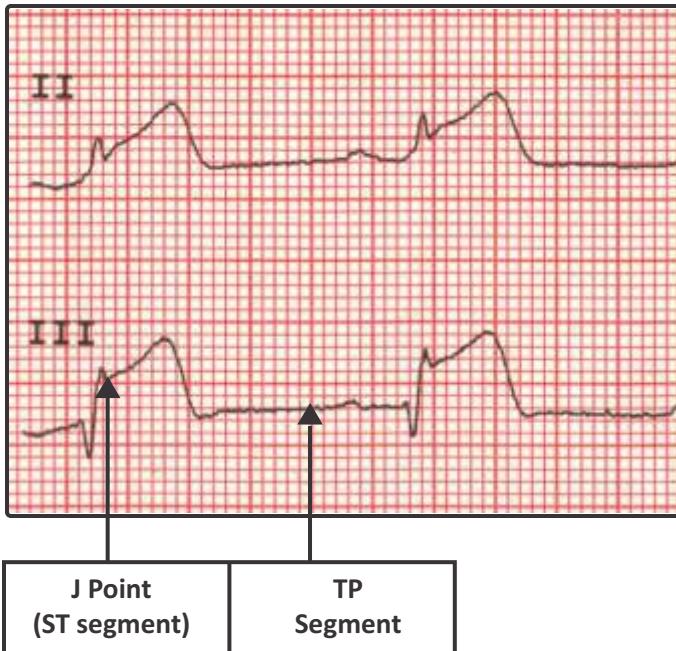
ERC Physician

Key points

- ECG
 - Rapid transport to cardiology center if ST elevation myocardial infarction (STEMI)
 - Caution with Sorbitrate and Tramadol if signs of inferior/right sided AMI
 - Up to 50% of patients with AMI will not have a STEMI on ECG
- Indications for emergent PCI or fibrinolysis
 - Symptoms of ACS (chest pain) for <12 hours which are continuing AND one of the following
 1. ST elevation ($\geq 1\text{mm}$) in ≥ 2 contiguous leads
-OR-
 2. Left bundle branch block (not known to be old)

Prehospital management options

- Consider Sorbitrate for HR between 55-120 and SBP >90 ; monitor for decreasing HR or BP



ST Elevation Myocardial Infarction (STEMI)

- Definition: ST elevation $>1\text{ mm}$ in 2 contiguous leads
- Measure the ST elevation by comparing the J point to the TP segment
- Contiguous lead groupings on ECG are
 - Inferior : II, III, AVF
 - Anterior : V1-V4
 - Lateral : V5-V6, I, AVL

Pediatrics

- Chest pain due to ACS is very rare in children and the provider should search for other causes

References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.
- Mark E. Nunnally, Robert A. Berg, Mary E. Mancini, et al. "Part 5: Adult Basic Life Support and Cardiopulmonary Resuscitation Quality: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care." Circulation 2020;142(16_suppl_2):S366-S468.

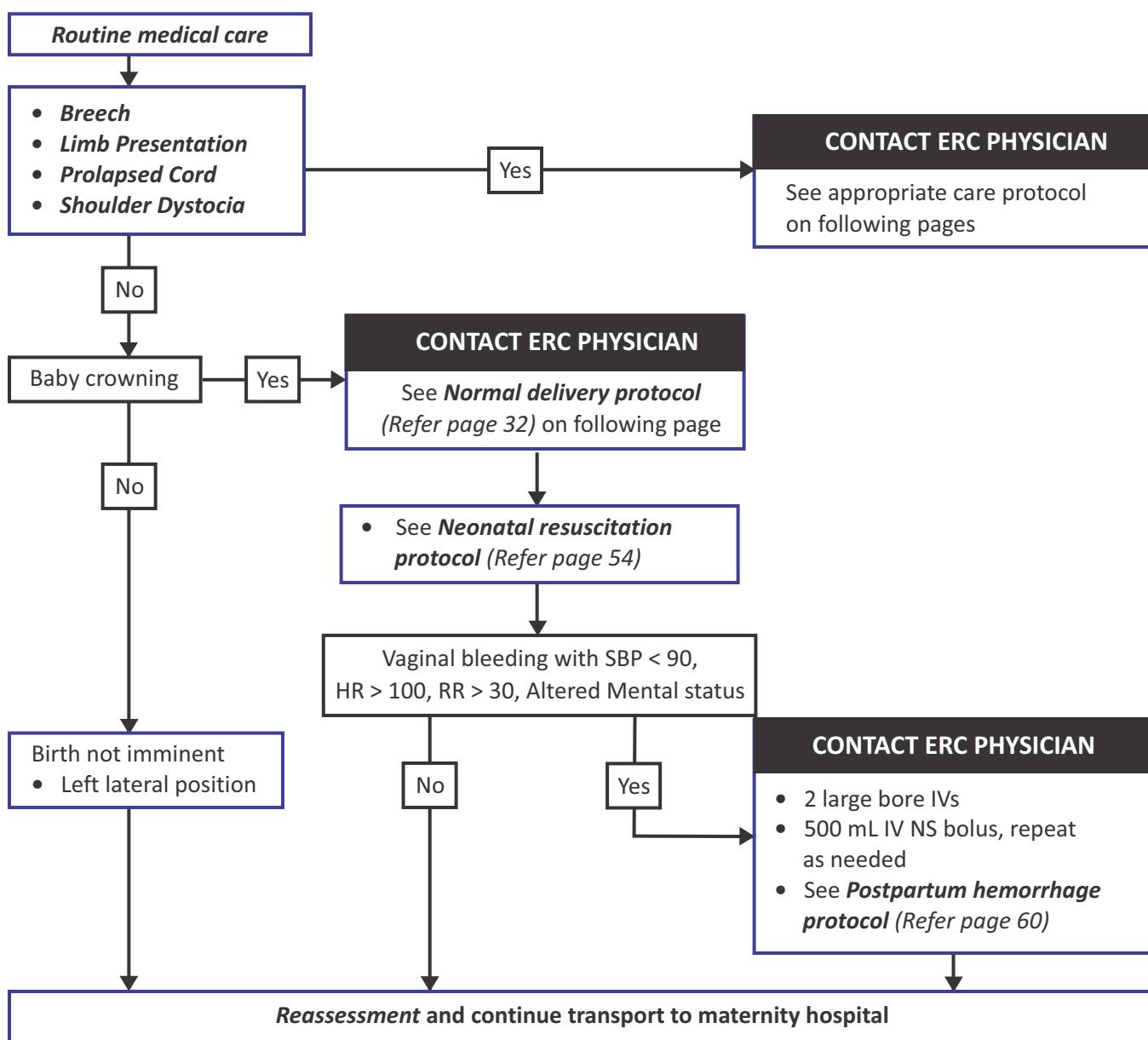
CHILDBIRTH (Uncomplicated/Complicated)

Key points

- Symptoms: Abdominal/back pain, vaginal bleeding/gush of fluid, minutes between contractions
- History of current pregnancy: Antepartum care, estimated gestational age, complications
- OB history: Number of pregnancies and c-sections, prior complications during pregnancy
- Physical exam: Inspecting external vaginal area for crowning/presenting part if patient feels like she wants to push or if she feels there is something protruding from her vagina
- *DO NOT* pull/push baby

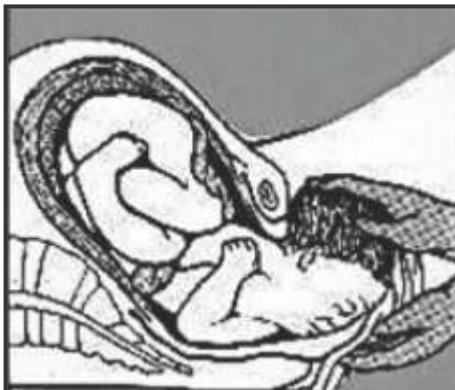
Serious signs and symptoms

- | | |
|---|-------------------------|
| • Part other than head presenting from vagina (arm, leg, umbilical cord) | • Shortness of breath |
| • SBP<90, HR>100 and RR >30, cool & moist skin | • Altered mental status |
| • Prolonged contractions (>6 contractions in 10 minutes or duration >2 minutes) | |



Normal Delivery

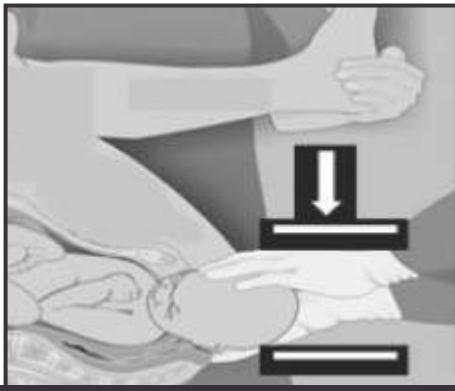
- Position patient
- Prepare OB kit
- Suctioning immediately following birth (including suctioning with a bulb syringe) should be reserved for babies who have obvious obstruction to spontaneous breathing or who require positive-pressure ventilation(PPV)
- Check for cord wrapped around neck
- If cord around neck, slip over shoulders/head of baby
- Second attempt: If the cord(s) is too tight, slip it back over the shoulders and deliver the body through the loop.
- If unable to unwrap cord, place umbilical clamps 5 cm apart and cut cord between clamps
- Support head, deliver body
- Place baby next to mother; dry baby and keep warm (see **Neonatal resuscitation protocol**) (Refer page 54)
- See **Post delivery care** on last page (Refer page 39)



Step 1: Support head and let head turn to side to align with body



Step 2: Check for cord and slip over head if present



Step 3: Keeping hands parallel to floor, apply downward pressure to deliver shoulder



Step 4: Support body and place next to mother

Shoulder Dystocia

Definition

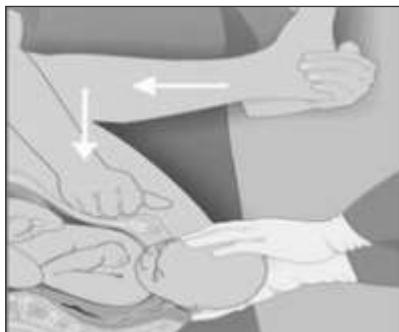
- Inability to deliver either shoulder within 60 seconds of delivery of head

Key points

- Complications
- Severe hypoxia, traumatic brachial plexus injuries and humerus/clavicle fractures
- *Turtle sign*: when fetal head moves back into the mother's perineum

Prehospital management options

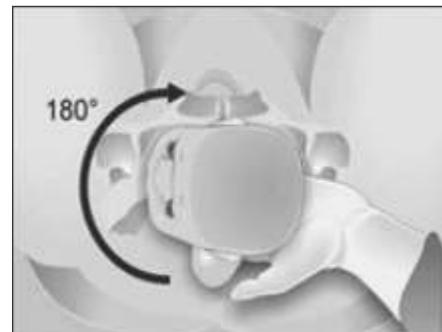
- He: Help (Call for Additional Assistance)
 - L: Position Legs, pull knees to chest*
 - P: Suprapubic Pressure (not fundal)*
 - R: Roll patient to knee to chest position, then deliver the posterior shoulder*
 - Consider secondary maneuvers
 - R: Remove the arm, sweep posterior arm across chest
- R: Rubin's II



Legs: Pull knees up
Pressure: Push down in suprapubic area (not fundal)



Enter maneuvers:
1) Push anterior shoulder forward
2) Pressure: Push anterior shoulder backward and posterior shoulder forward



Roll on to knee chest position and deliver posterior shoulder first by gentle downward pressure on fetal head



Remove posterior arm by bending at elbow and sweeping across chest and out



Breech Presentation

Definition

- When buttocks (or legs) deliver first

Key points

- Transport immediately
- **AVOID** delivery in ambulance if possible. Tell patient not to push.

Prehospital management options

- Determine if buttocks or limb is presenting first
 - If limb (leg or arm) is presenting first, see **Limb presentation** section on the following page

CAREFUL

- Check dilatation, presentation, cord
- Await umbilicus
- Rotate to deliver anterior shoulder
- Enter for MSV
- Flex head
- (back) Up (sacrum anterior)
- Lift baby onto mother
- Delivery of breech presentation
 - **Step 1**
 - Support baby and allow delivery to proceed passively until base of umbilical cord is seen
 - **DO NOT** pull baby
 - **Step 2**
 - Grab the bony pelvis and femurs and apply gentle traction
 - **DO NOT** grab the abdomen as you may injure abdominal organs
 - **Step 3**
 - Once the wing-like scapulae are visible, rotate the fetus until a shoulder is anterior and deliver the arm. Rotate 180 degrees and deliver the other arm. Position the fetus so that the back is facing anteriorly.
 - **Step 4**
 - Anteriorly place a gloved middle finger on the fetus's occiput. The index and ring finger rest on the shoulders. Place a hand posteriorly sliding the index and middle finger into a V shape along the baby's face. Gently place pressure on the cheek bones.
 - Performing these maneuvers at the same time causes the fetal head to flex.
 - Additionally, one assistant can apply suprapubic pressure to help with flexion of the head. Another assistant can support the body.
 - See **Post delivery care** section on last page of the protocol

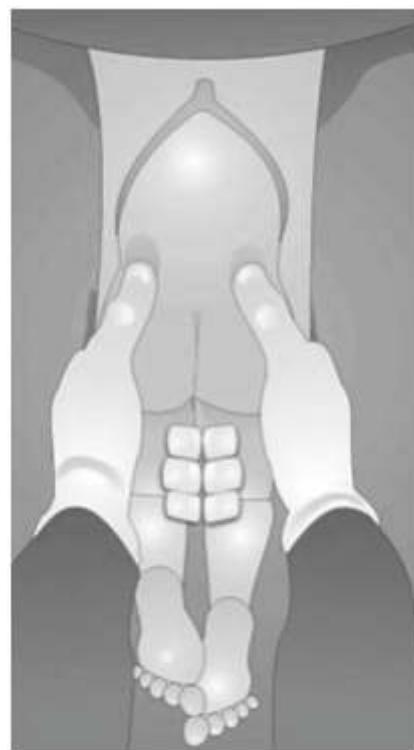


Frank breech Complete breech Footling breech
 Presentation is the part of the fetus that is coming out of birth canal first

Delivery Steps for Breech Presentation



Step 1: Support the body



Step 2: Gentle traction on bony pelvis



Step 3: Rotate each shoulder anteriorly and deliver arms



Step 4: Flex the fetal head by placing the middle finger on the occiput and the other middle and index finger on the cheek bones.
If second provider is available, have them apply suprapubic pressure

Cord Presentation (Prolapsed Cord)

Definition

- Umbilical cord presents/is seen before the head or other part of the baby

Key points

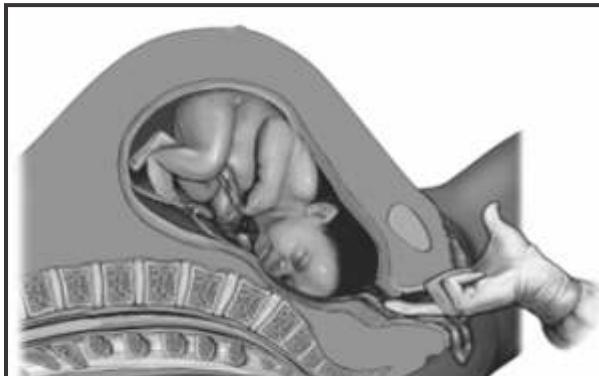
- If the umbilical cord is compressed, blood flow and oxygen don't reach the baby
- Transport immediately and try to avoid delivery in the ambulance
- Tell the patient *NOT* to push

Prehospital management options

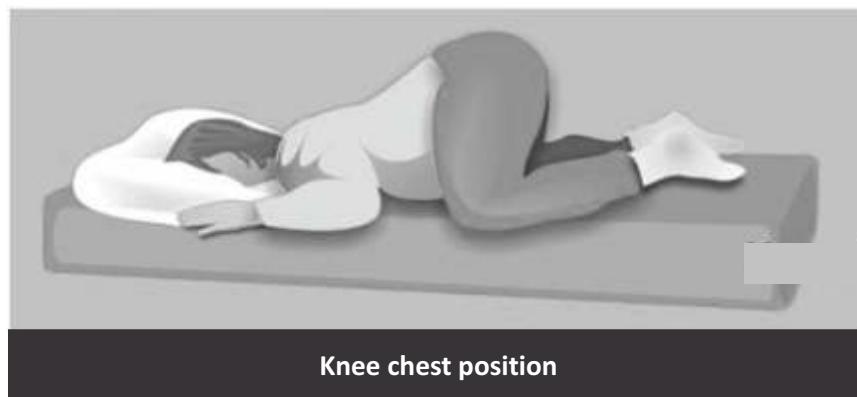
- With two fingers of your gloved hand, gently push the presenting part of baby (not the cord) back up into the vagina until the presenting part no longer presses on the cord
 - *DO NOT* remove your hand (after elevating the presenting part of the baby) until arriving at the hospital and being relieved by other hospital personnel
- With your other hand, palpate the cord and feel the fetal HR. If <110 bpm, Roll patient into knee to chest position this may relieve pressure on the cord.

Prolonged transport or in hospital management options

- Wrap the cord loosely with a moist, warm dressing



Once prolapsed cord is seen, push the presenting part (not the cord) gently back up



Knee chest position

Limb Presentation

Definition

- When one limb of the baby delivers first

Key points

- Nearly all of these patients will require delivery by caesarean-section
- Transport immediately. Avoid delivery in the ambulance if possible.
- Tell the patient *NOT* to push.

Prehospital management options

- Place mother in knee chest position
- Oxygen
- *DO NOT* attempt to deliver the baby
- *DO NOT* pull on the presenting limb
- *DO NOT* place your hand into the vagina unless there is a prolapsed cord
(see **Cord presentation** section on previous page)

Multiple Births

Key points

- Usually both babies are born before the first placenta is delivered
- In order to prevent bleeding from the 2nd twin, carefully inspect the cord and apply a second clamp if leaking blood (oozing)
- Contractions usually restart within 5-10 minutes after the first baby is born; the second baby usually delivers within 30-45 minutes of the first baby



Limb presentation with prolapsed umbilical cord

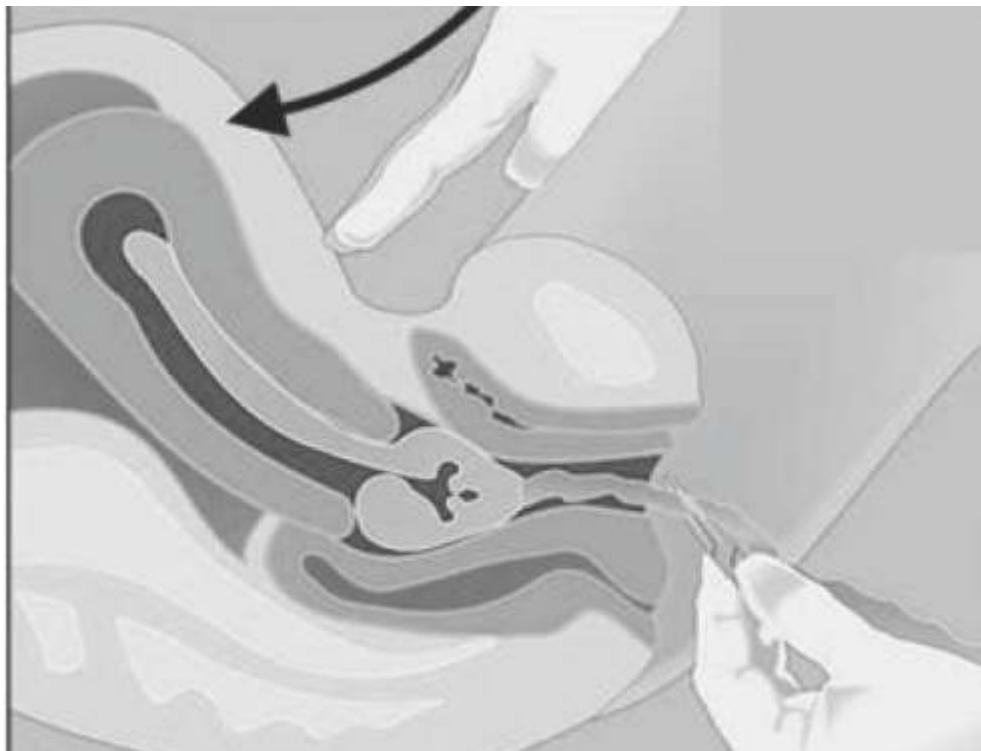


Twin gestations may present with the fetuses lying in multiple positions

Post Delivery Care

Active management of 3rd stage of labor (following delivery of all fetuses)

- See ***Neonatal resuscitation protocol*** (Refer page 54)
- **Oxytocin 10 Units IM** to mother immediately following delivery , if not already given (after the delivery of anterior shoulder)
- Consider multiple fetuses and do not give until all babies are delivered
- Record time of birth
- Assess APGAR scores at 1 and 5 min after birth
- For babies who don't require immediate resuscitation, wait at least 30 – 60 seconds before cord clamping and cutting
- Gently pull on the umbilical cord while providing suprapubic pressure (see below)
- Once the placenta delivers, place the placenta in a bag and give it to hospital staff
- Externally massage the uterus
- If significant ongoing bleeding or signs of maternal shock, see ***Postpartum hemorrhage protocol*** (Refer page 60)



Placenta delivery: Gently pull on cord while applying pressure to suprapubic area

References

- Royal College of Obstetricians and Gynaecologists. "Shoulder Dystocia. Green-top Guideline No. 31." 2013. Available at: https://www.rcog.org.uk/media/ewgpnmo/gtg_42.pdf

ENVENOMATION / SNAKE BITE

Definition

- Venom injection by bite or sting of an animal (insects, spiders, reptiles, mammals)

Key points

- Ensure safe environment
- *DO NOT* place tourniquet- but can place pressure dressing on the wound

Differential diagnosis

- | | | | | |
|-------------|----------|---------------------|--------|--------------------|
| • Infection | • Trauma | • Allergic reaction | • Burn | • Toxin/poisonings |
|-------------|----------|---------------------|--------|--------------------|

Serious signs and symptoms

- | | | |
|-----------------------|--------------------------------|-------------------------|
| • Weakness/numbness | • Slow respirations | • Abdominal pain |
| • Dizziness/giddiness | • Anxiety/restlessness | • Altered mental status |
| • Active bleeding | • Nausea, vomiting or diarrhea | • Chest pain |
| • Swelling | • Shock | |

Routine medical care



CONTACT ERC PHYSICIAN

- Cardiac monitor
- Place IV in unaffected extremity
- Monitor pulses in affected extremity
- Remove rings/constrictive clothing
- Reassure patient

Serious signs and symptoms

Yes

- See **Airway management protocol** (Refer page 05) if decreased respirations or facial paralysis
- 500 mL IV NS bolus

No

Wound care

- Immobilize extremity with a splint or dressing in a dependent position
- Loose wound dressing only irrigate with water if eyes are exposed
- Mark proximal extent of swelling permanent marker and note the time of marking
- Do not remove tourniquets placed prior to ambulance arrival

Reassessment and continue transport

- Consider pain control
- Mark swelling every 15 min

ERC Physician

Key points

- 20% of snake bites result in significant envenomation
- 50% of snake bites are dry bites or bites without envenomation

Common venomous snakes: Russell's Viper, Saw-scaled Viper, Indian Cobra, Common Krait

Syndrome 1- Viperidae (all species) :

- Local envenomation with bleeding/clotting disturbances

Syndrome 2:Russell's viper:

- Local envenomation with bleeding / clotting disturbances, shock or acute kidney injury and conjunctival chemosis and acute pituitary insufficiency , Myanamar and South India and bilateral ptosis, external ophthalmoplegia facial paralysis and dark brown urine, Srilanka and South India

Syndrome 3: Cobra:

- Local envenomation with paralysis
- Cobra- Spit ophthalmia: Immediate intense pain, profuse watery with whitish discharge, congested conjunctivae, spasm and swelling of eyelids

Syndrome 4: Krait:

- Paralysis with minimal or no local envenomation
- Bitten while sleeping on the ground with/without abdominal pain

Vipers: *Hemotoxin venom*

- Local tissue injury
- Systemic vascular damage causing edema and hypovolemia
- Systemic coagulopathy, hemolysis, fibrinolysis
- Kraits, Cobras: *Neurotoxin venom*
 - Neuromuscular blockade at synapse
 - Muscle weakness: ptosis, bulbar weakness, dysphagia, respiratory failure
 - Cell membrane deregulation: dysrhythmias, impaired contractility

Prehospital management options

- Consider second large bore IV
- Repeat 500 mL IV NS bolus to keep SBP >90
- **Paracetamol 1000 mg IV/IM** as needed for pain
- **Tramadol 25-50 mg IV** as needed for severe pain; do not give if SBP <90 or RR <12

Pediatrics

Prehospital management options

- **Snake Bite Antiserum** dosing is the same as for adults
- **Paracetamol 15 mg/kg IV** to maximum of 1000 mg
- 20 mL/kg IV NS bolus if **Serious signs and symptoms** are present

References

- Boesen KJ, Boesen K, Hurst NB, Shirazi FM. Exotic nonnative snake envenomations. In: Nelson LS, Howland MA, Lewin N A , Smith SW, Goldfrank LR, Hoffman RS, eds. Goldfrank's Toxicologic Emergencies. 11th ed. McGraw Hill; 2019.

GASTROINTESTINAL BLEEDING (GIB)

Definition

- Bleeding in stool or vomit

Key points

- High risk for aspiration if vomiting
 - Position the patient to minimize risk; closely monitor airway
- Estimate volume of blood loss
- Identify current medications (NSAIDs, anticoagulants)
- Patients with history of alcohol use or cirrhosis are at high risk for severe GIB

Differential diagnosis

- Upper GIB:* Peptic ulcer disease, gastric erosions, varices, esophageal bleeding after vomiting
- Lower GIB:* Rapid upper GIB, diverticulosis, angiodysplasia, cancer/polyps

Serious signs and symptoms

- | | |
|---|--|
| <ul style="list-style-type: none"> Black (melena) or bloody (hematochezia) stools Vomiting blood or coffee ground material (hematemesis) Severe abdominal pain | <ul style="list-style-type: none"> Giddiness (light headedness) Shock (hypotension, tachycardia) |
|---|--|

Routine medical care

- ABC's with special consideration for airway – High risk for airway compromise so consider early advanced airway

- ↓
- Suction as needed
 - Advanced airway as needed proceed to **Airway protocol (Refer page 05)**
 - 2 large bore IVs
 - Consider 500 mL IV NS bolus

SBP <90, HR >100

-OR-

Serious signs and symptoms

Yes

CONTACT ERC PHYSICIAN

- 500mL IV NS bolus; and reassess, can repeat for max 1000ml
- After second bolus consider vasopressors
- Recheck vital signs every 5 min

No

Reassessment and continue transport

ERC Physician

Key points

- High risk patients
 - Liver cirrhosis/portal hypertension/alcoholic: consider gastroesophageal varices
 - Previous thoracic/abdominal surgery: consider aorto-enteric fistula
 - Pain out of proportion to exam or past medical history of embolic disease/atherosclerosis: consider bowel ischemia

Prolonged transport or in hospital management options

- Consider the following medications:
 - Pantoprazole 80mg IV bolus

Pediatrics

Key points

- Common causes of upper GIB
 - Esophagitis, gastritis, ulcer, varices
- Common causes of lower GIB
 - Anal fissures, infectious colitis, food allergy, inflammatory bowel disease, intussusception
- Small amount of blood loss can lead to hemodynamic instability

Prehospital management options

- 20 mL/kg IV NS bolus, may repeat as needed up to 60 mL/kg

References

- Walls RM (ed). Rosen's Emergency Medicine: Concepts and Clinical Practice, 10th ed. Mosby, St Louis, MO, 2023.
- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.
- Sachar H, Vaidya K, Laine L. Intermittent vs Continuous Proton Pump Inhibitor Therapy for High-Risk Bleeding Ulcers: A Systematic Review and Meta-analysis. JAMA Intern Med. 2014;174(11):1755–1762.
doi:10.1001/jamainternmed.2014.4056

HEAT ILLNESS

Definition

Heat Illness-Heat related illness is caused by high temperatures and humidity

- **Heat cramps:** acute, involuntary muscle spasms associated with exercise
- **Heat exhaustion:** mild form of heat illness; Temp can be elevated but Temp < 104°F (40°C)
- **Heat stroke:** T >104°F (40°C) and altered mental status including seizure or Coma

Key points

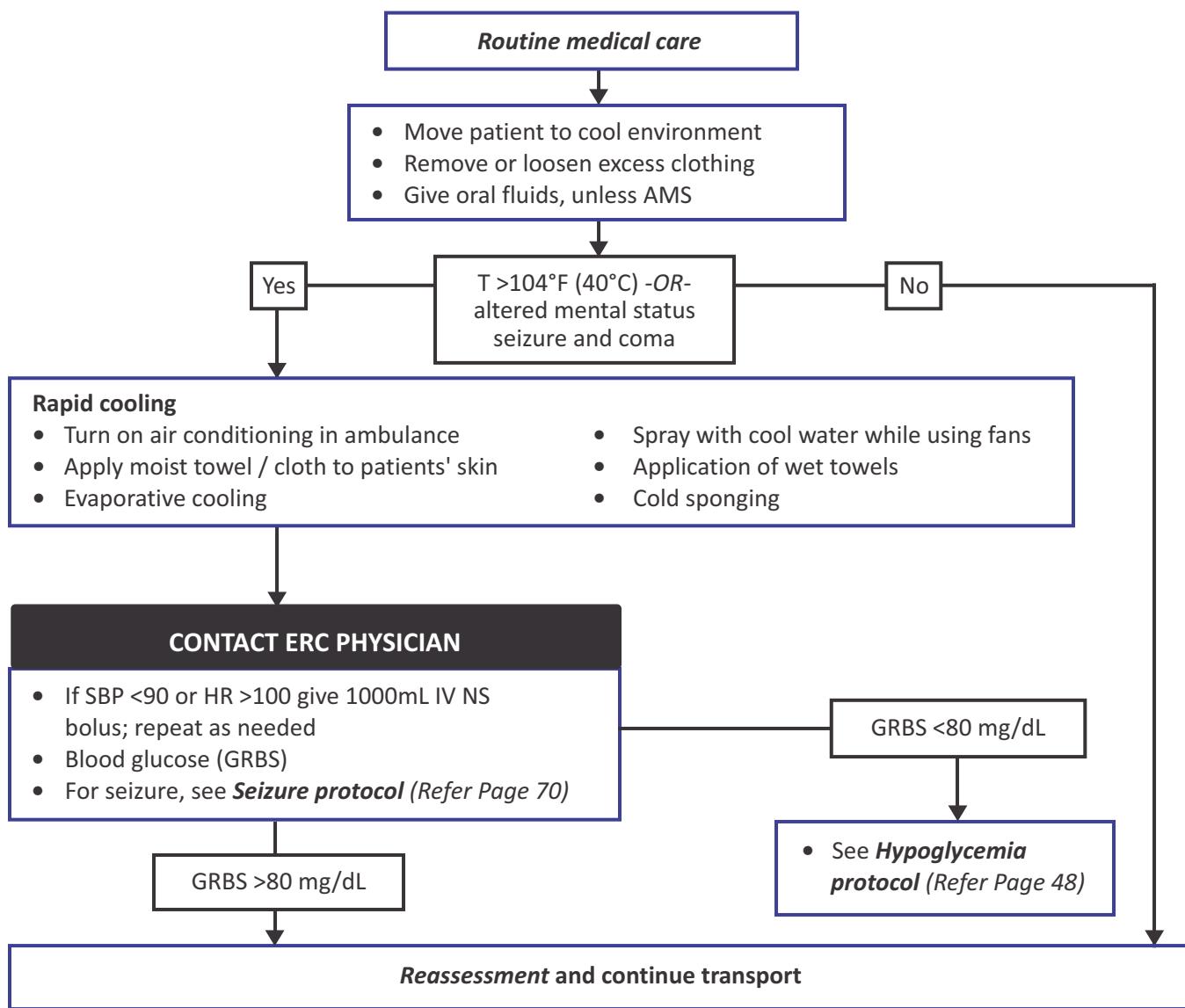
- Cool patient, but *DO NOT* cause shivering
- Consider in athletes, elderly patients, people exercising in extreme heat

Signs and symptoms

- Headache
- Fatigue (tired), dizziness (giddiness)
- Nausea/vomiting
- Lack of sweating, dry skin

Serious signs and symptoms

- T >104°F (40°C)
- Altered mental status



ERC Physician

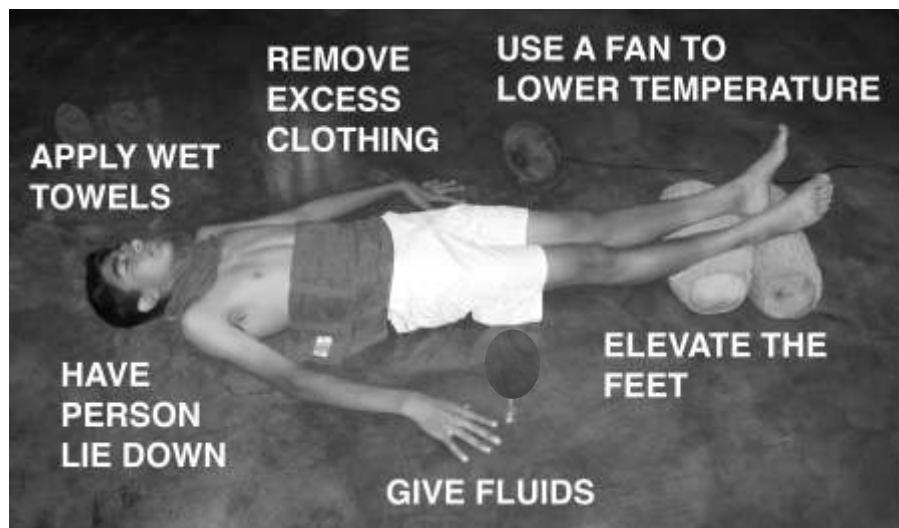
Key points

Prehospital management options

- Manage airway
- Cooling
 - Best approach is evaporative cooling: spraying patient with cool water and using fans
 - When **Serious signs and symptoms**, use all available methods of cooling
- Concern for *rhabdomyolysis*
 - Definition: break down of muscle
 - Treatment
 - 1000 mL IV NS bolus; repeat as needed

Prolonged transport or in hospital management options

- Hypotension: if hypotension persists in spite of 2 L of fluids consider vasopressors preferably noradrenaline
 - **Dopamine 5-20 mcg/kg/min IV** (by infusion pump) if SBP <90; titrate to SBP 90-110
 - **Noradrenaline 1-30 mcg/min IV** (by infusion pump) if SBP <90; titrate to SBP 90-110
 - **Adrenaline 2-10 mcg/min IV** (by infusion pump) if SBP <90; titrate to SBP 90-110



References

- Eifling KP, Gaudio FG, Dumke C, Lipman GS, Otten EM, Martin AD, Grissom CK. Wilderness Medical Society Clinical Practice Guidelines for the Prevention and Treatment of Heat Illness: 2024 Update. *Wilderness Environ Med.* 2024;35(1 Suppl):112S–127S.

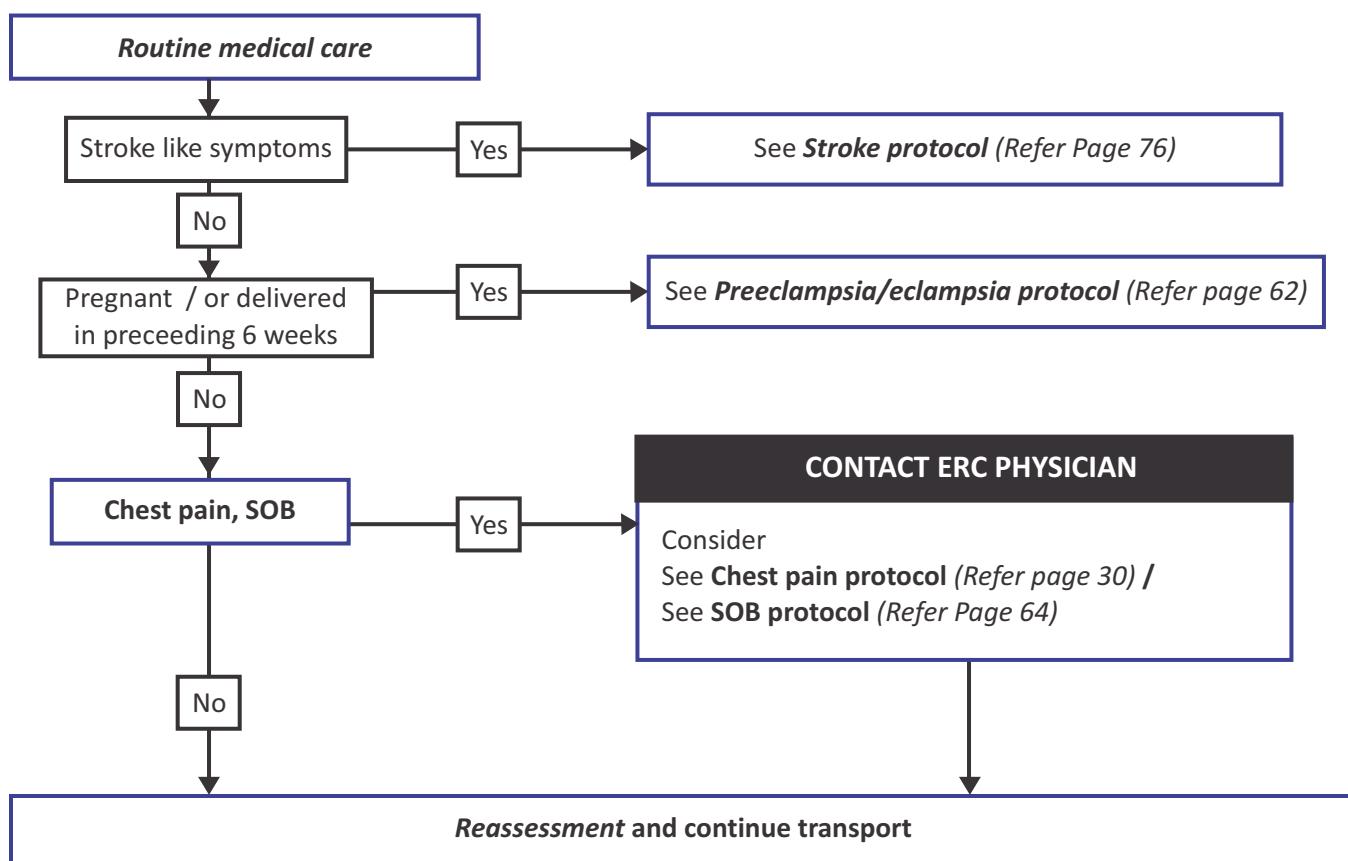
HYPERTENSIVE EMERGENCY

Definition

- **Hypertension:** Systolic blood pressure (SBP) ≥ 140 mmHg, diastolic BP (DBP) ≥ 90 mmHg
- **Hypertension without any serious signs and symptoms does not need treatment**
- **Treatment is only required for hypertension in certain circumstances based on algorithm**
 - **Hypertensive emergency:** SBP ≥ 180 mmHg or DBP ≥ 120 mmHg **WITH Serious signs and symptoms**
 - Preeclampsia:
 - Pregnant patient, >20 weeks Or within 6 weeks of delivery
 - SBP ≥ 140 mmHg OR DBP ≥ 90 mmHg and symptoms such as confusion, headache, visual changes, epigastric pain
 - Eclampsia
 - SBP ≥ 140 mmHg OR DBP ≥ 90 mmHg and seizures

Serious signs and symptoms

- Nausea/ vomiting
- Chest pain
- Shortness of breath
- stroke like syndrome: one sided weakness, one sided numbness, difficulty speaking or understanding speech, vertigo, ataxia or double vision



ERC Physician

Key points

- Treat hypertensive emergency (**Serious signs and symptoms**) but not hypertensive urgency
- Goal of treating hypertensive emergency is lowering the BP in a gradual, controlled manner
 - Reduce SBP 20% over 30-60 minutes for ex. *SBP 220mmHg -> 175mmHg*
- If one-sided weakness, facial droop, arm drift or abnormal speech, see **Stroke protocol** (Refer page 76); **DO NOT treat BP**

Prehospital management options

- **Sorbitrate 5 mg SL** every 10 min as needed
 - Withhold Sorbitrate (PDE-5 inhibitors) in past 36 hours
 - Preferred in patients with cardiac ischemia or pulmonary edema
- **Labetalol 10 mg slow IV push**; can be repeated every 10 minutes as needed
- Amphetamine or cocaine use:
 - Consider **Midazolam 2 mg IV/IM or Diazepam 5 mg IV/IM**

Prolonged transport or in hospital management options

- Consider other treatment options:
 - **Nitroprusside 0.25-0.5 mcg/kg/min** (infusion by pump)
 - **Nitroglycerin 20-100 mcg/min** (infusion by pump)

Life-threatening complications

- AMI
- Intracranial and subarachnoid hemorrhage
- CVA (stroke)
- Aortic dissection
- Hypertensive encephalopathy
- Acute renal failure
- Eclampsia/preeclampsia
- Uncontrolled hemorrhage

Pediatrics

Key points

- Occurs very rarely in children
- Hypertension definition: SBP or DBP $\geq 95^{\text{th}}$ percentile for age
- Hypertensive emergency: elevation of BP with **Serious signs and symptoms**
- Commonly presents as hypertensive encephalopathy (lethargy, coma and/or seizures)

Prehospital management options

- Confirm elevated BP and assess for **Serious signs and symptoms**
- If hypertensive emergency:
 - **Labetalol 0.2-1 mg/kg IV** (maximum 10 mg per dose, 40 mg total)

References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.
- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Philadelphia, PA: Elsevier; 2022.
- Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension. 2018;71(6):e13–e115.

HYPOGLYCEMIA

Definition

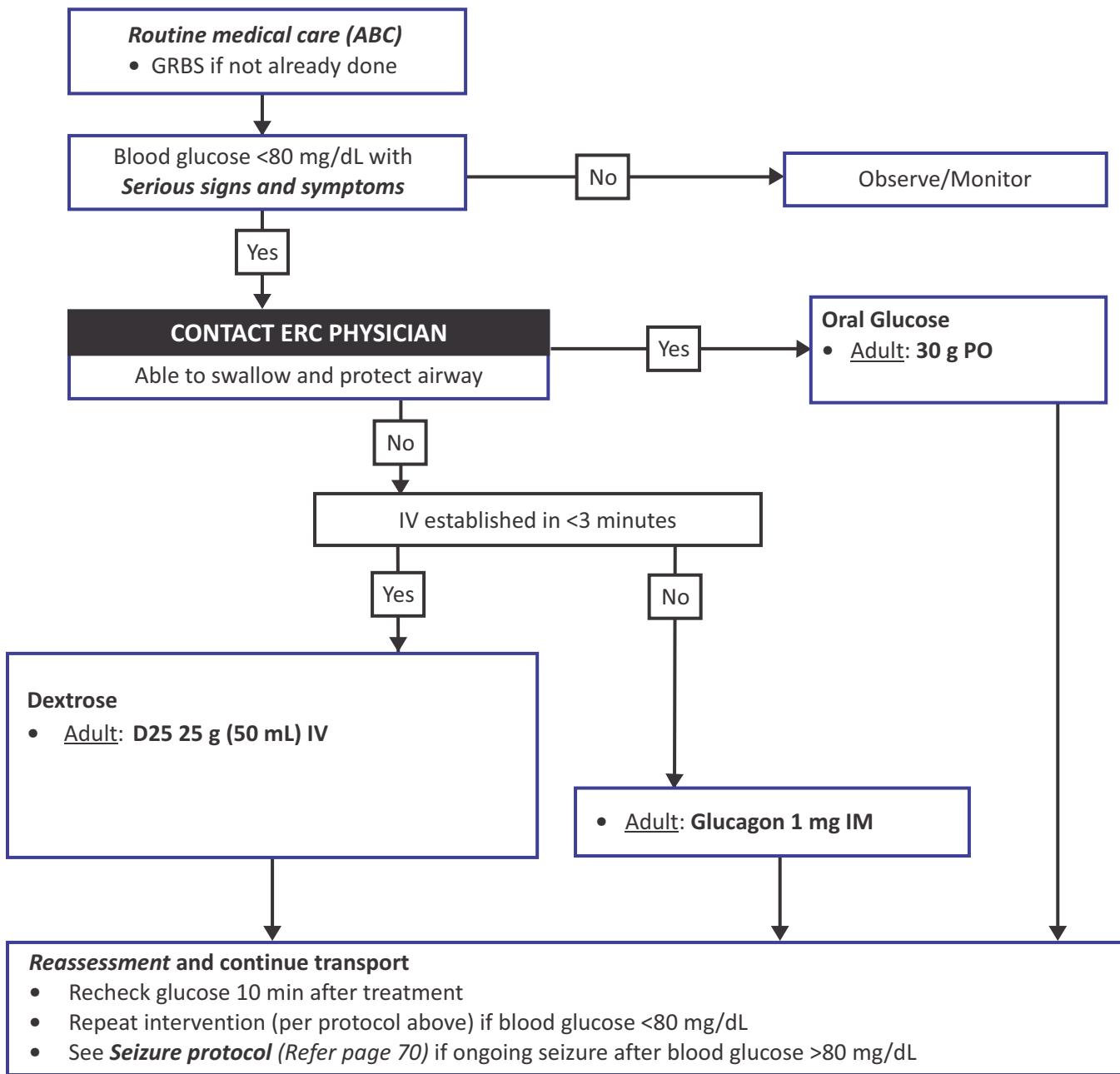
- Hypoglycemia is a blood glucose <80 mg/dL (4.4 mmols/L)

Key points

- Hypoglycemia can cause brain damage and death
- Hypoglycemia in adults is usually caused by diabetes medications or severe infections
- Check blood glucose (GRBS) in all patients with seizure, stroke, or altered mental status

Serious signs and symptoms

- Shaking • Anxiety • Sweaty • Altered mental status • Unconscious
- Seizure (fits) • Neurologic deficits (paralysis, motor deficits, sensation deficits)



ERC Physician

Prehospital management options

- Continue to check blood glucose every 10 min until hypoglycemia resolves
- If the patient has hypoglycemia despite 2 doses of glucose, consider **Glucagon 1 mg IV/IM**
- If the patient is seizing despite dextrose, give **Midazolam 10mg IM or 5mg IV** (see *Seizure protocol*) (Refer Page 70)
- Glucagon will usually lead to elevations of blood glucose within 10 minutes, and may cause nausea and vomiting

Pediatrics

Key points

- Hypoglycemia in children is GRBS <60mg/dl, infants < 50mg/dl neonates < 45mg/dl
- The most common causes of hypoglycemia in children are dehydration, infection, and malnutrition
- Most children with hypoglycemia will require oral or intravenous hydration

Prehospital management options

- **Dextrose**
 - Child: D25 1 g/kg (4 mL/kg) IV up to 25 grams/100ml D25
 - Infant: D10 1 g/kg (5 mL/kg) IV
 - If D10 not available, use D25 and reduce concentration to 12.5%
 1. Take a vial of D25
 2. Draw up desired amount of glucose in syringe
 3. Draw up equal amount of sterile water or sterile saline
 4. Mix together and administer 5 mL/kg to patient
- **Oral glucose paste**
 - Child <10 years: 15 g PO
- **Glucagon**
 - Child <20 kg: 0.05 mg/kg IV/IM up to 1 mg

References

- Marx JA (ed). Rosen's Emergency Medicine: Concepts and Clinical Practice, 7th ed. Mosby, St. Louis, MO, 2010.
- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY, 2012.

HYPOTHERMIA

Definition: Unintentional drop in core body temperature to 35°C or lower

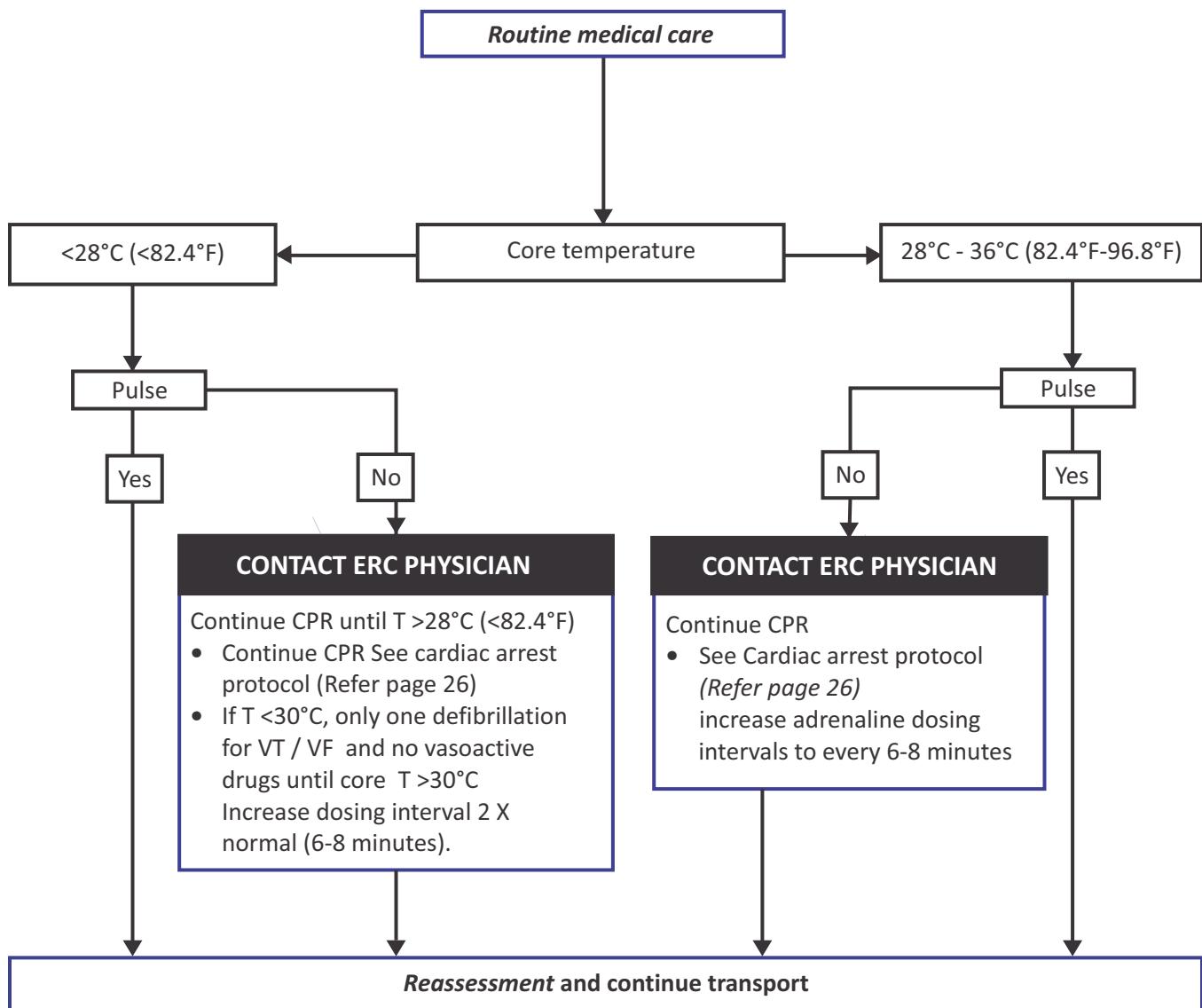
- *Mild:* Temperature 35-32°C (95-89.6°F)
- *Moderate:* Temperature 32-28°C (89.6-82.4°F)
- *Severe:* Temperature <28°C (<82.4°F)

Key points

- Do pulse checks for 60 seconds

Serious signs and symptoms

- | | | |
|---------------------|---------------|--------------------------|
| • AMS | • Hypotension | • Decreased respirations |
| • Loss of shivering | • Dysrhythmia | |



ERC Physician

Key points

- Risk factors for hypothermia: elderly, pediatric, alcohol/drug use, submersion, AMS
- Continue CPR until patient is warmed ($T > 35^\circ\text{C}$)

Prehospital management options

- Pulseless
 - If $T < 30^\circ\text{C}$, only one defibrillation for VT / VF and no vasoactive drugs until core $T > 30^\circ\text{C}$

Rewarming techniques

Passive external rewarming

- Remove wet clothing
- Dry the patient's skin
- Move into warm ambulance
- Warm blankets

Active internal rewarming (as available)

- Warm IV fluids (43°C)
- Warm, humidified oxygen ($42\text{--}46^\circ\text{C}$)

Active external rewarming

- Hot packs to groin, neck, axilla (use with barrier to protect skin)
- Forced hot air

Pulseless resuscitation endpoints

Continue internal rewarming until any one of the following occurs

- Core $T > 35^\circ\text{C}$ -OR-
- Return of spontaneous circulation -OR- *resuscitative efforts cease*

References

- Dow, Jennifer, Gordon G. Giesbrecht, Daniel F. Danzl, Hermann Brugger, Emily B. Sagalyn, Beat Walpoth, Paul S. Auerbach, et al. "Wilderness Medical Society Clinical Practice Guidelines for the Out-of-Hospital Evaluation and Treatment of Accidental Hypothermia: 2019 Update." *Wilderness & Environmental Medicine* 30, no. 4 (December 2019): S47–69. <https://doi.org/10.1016/j.wem.2019.10.002>.
- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2 ed. Cambridge University Press, New York, NY 2012.

OPIOID POISONING

Definition

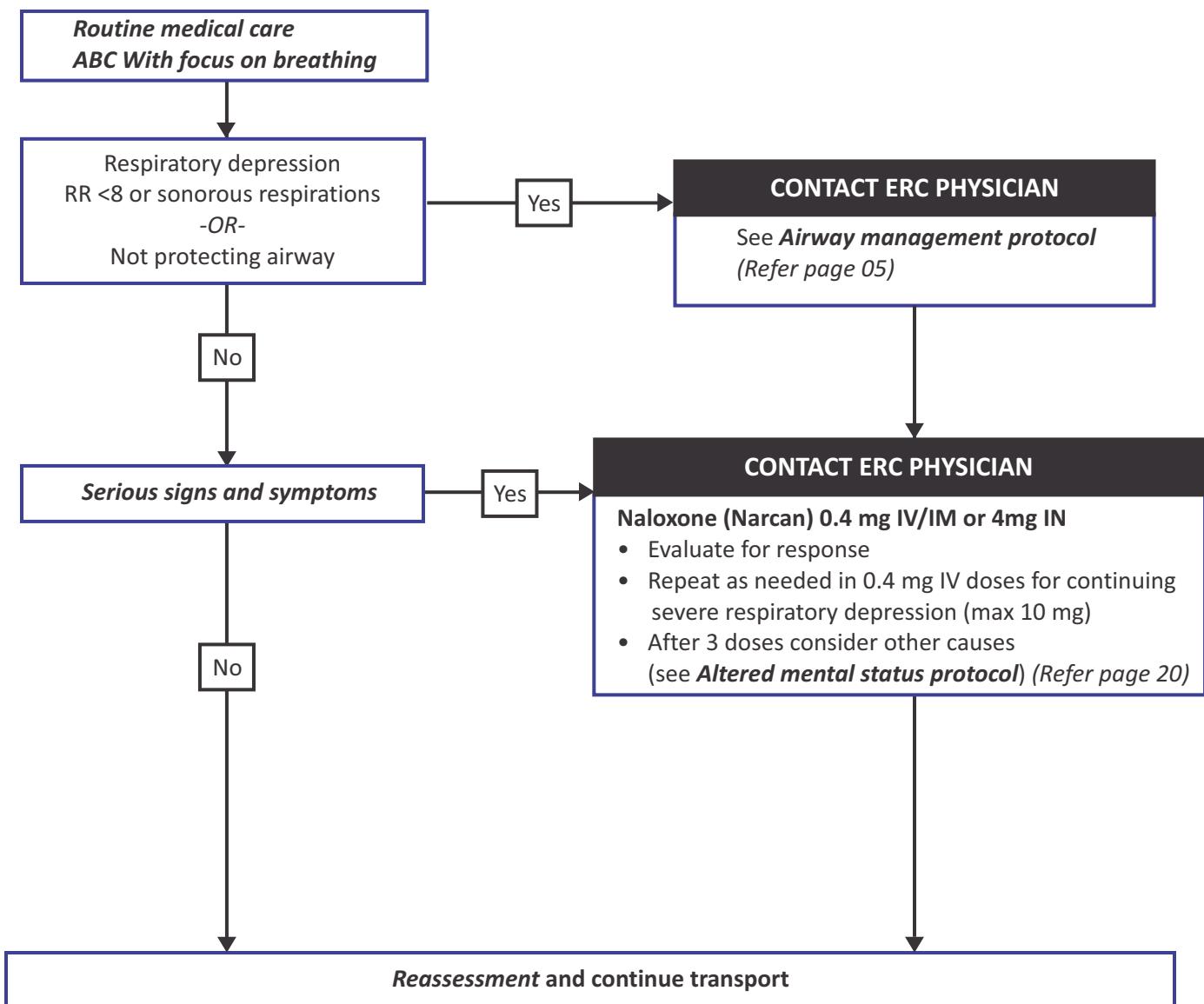
- **Opioids and opiates:** A class of drugs often used for pain management. They may be taken accidentally or intentionally and may lead to serious side effects.
 - Narcotic examples: heroin, morphine, codeine, fentanyl, hydrocodone, oxycodone

Key points

- Environment: search for syringes, pill containers, powder filled bags of heroin
- Identify substance type, amount and time of ingestion/exposure
- Consider multidrug poisoning

Serious signs and symptoms

- | | |
|--------------------------|---------------|
| • Respiratory depression | • Hypotension |
| • Altered mental status | • Bradycardia |



ERC Physician

Key points

- Airway/breathing management and administration of reversal agents are key to management

Prehospital management options

- **Naloxone (Narcan) 0.4 mg IV/IM** (IV preferred, can give IM or IN)
 - Goal is adequate ventilation, not normal Level of consciousness
 - Naloxone can precipitate acute withdrawal in chronic opioid users
 - Withdrawal symptoms: CNS excitation, tachypnea, mydriasis, hypertension, tachycardia, piloerection, yawning, diaphoresis and rhinorrhea
 - Start at 0.4 mg and slowly titrate up. Start at 2mg for cardio pulmonary arrest
 - Duration of action for naloxone is 1-2 hours (shorter than the duration of many opioids, therefore repeat doses or continuous infusion may be required)
 - Doses >10 mg may be required for synthetic narcotics
- **Activated charcoal 50 g PO/NGT**
 - Consider if ingestion <1 hour ago
 - Patient needs to be alert, able to swallow and protecting airway unless giving by NGT

Prolonged transport or in hospital management options

- Naloxone (Narcan) infusion
 - Calculate total initial dose required to reverse respiratory depression
 - Give 2/3 of this dose every hour
 - Stop if signs of opioid withdrawal develop
- A stable patient (after ingestion) should be observed for at least 4 hours before hospital discharge
- Patients who ingested an opioid with a longer half-life or multiple drugs should be observed longer

Pediatrics

Prehospital management options

- **Naloxone (Narcan)**
 - Child <20 kg: 0.01 - 0.1 mg/kg IV/IM (maximum 2 mg per dose)
 - Apneic newborns intoxicated due to maternal opioid abuse: **0.01 mg/kg IV/IM/IN**
 - Child >20 kg: 0.4 mg IV/IM
 - Repeat every 3 min until improvement in respiratory depression (maximum dose: 10 mg)
 - As with adults, lower doses (0.2-0.4 mg) should be used if opioid addiction is suspected
 - Ensure airway protected prior to administration

References

- Nelson LS, Howland M. Opioid antagonists. In: Nelson LS, Howland M, Lewin NA, Smith SW, Goldfrank LR, Hoffman RS, eds. Goldfrank's Toxicologic Emergencies. 11th ed. McGraw Hill; 2019.

NEONATAL RESUSCITATION

Definition

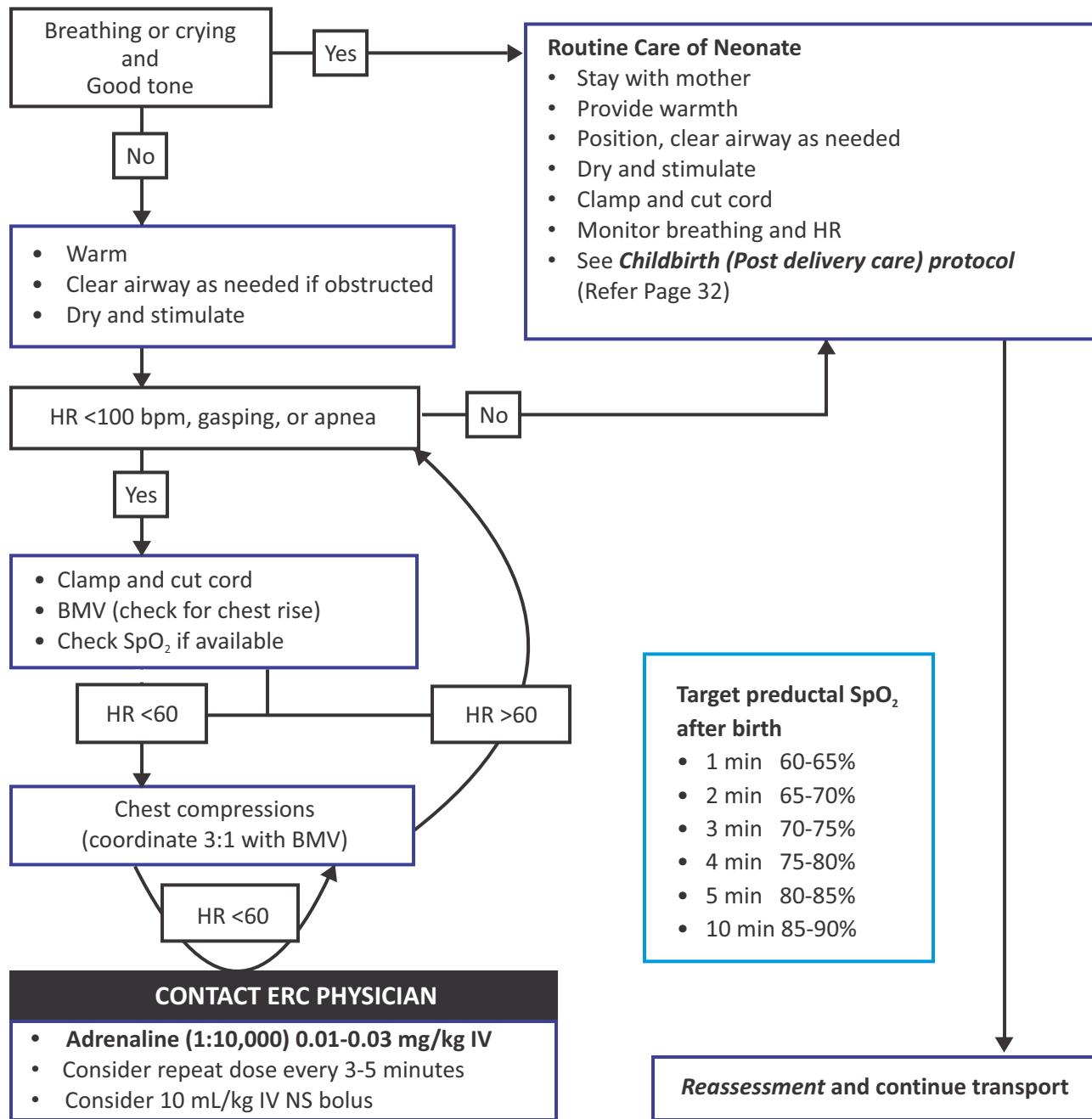
- Resuscitation of a newborn upto 1 month old

Key points

- Do not take longer than 60 sec to warm, dry, stimulate, clear airway (if obstructed) and begin ventilation (if required)
- Assessment of HR should be done by palpation of the umbilical cord stump or auscultation

Serious signs and symptoms

- Respiratory distress (apnea, gasping, or labored breathing)
- Heart rate <100



ERC Physician

Key points

- Suction only for obvious obstruction to spontaneous breathing
 - Suctioning of meconium has not been shown to improve mortality
- Bradycardia (HR <100) in newborns is usually from inadequate lung inflation or profound hypoxia
 - Adequate ventilation is the most important intervention
 - Pulse checks every 30 seconds until HR >100 and adequately ventilating

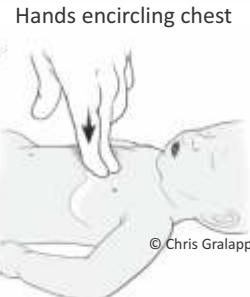
Prehospital management options

- Rewarming techniques include placing skin-to-skin with mother, blankets and wrapping in plastic
- BMV
 - If provider not experienced with advanced airway management, BMV preferred
 - Lungs easily injured by over inflation; inflate only enough to see chest wall begin to rise
 - Use ventilation rates of 40-60 breaths per minute
 - Measure of adequate initial ventilation if prompt improvement in HR (HR >100)
- LMA (size 1): effective for ventilating newborns weighing >2000 g or ≥ 34 weeks gestation
- ETT indications (use size 3.0):
 - Initial endotracheal suctioning of nonvigorous meconium-stained newborns
 - If BMV is ineffective or prolonged
 - If chest compressions are performed
- Chest compressions (**See Figure**)
 - Indicated for HR <60 despite adequate ventilation with oxygen for 30 seconds.
 - Do compressions on lower third of sternum
 - 3:1 ratio of compressions to ventilations
(90 compressions and 30 breaths/min)
- Medications
 - **Adrenaline (1:10,000) 0.01-0.03 mg/kg/dose IV**
 - Can consider 0.05-0.1 mg/kg through endotracheal tube if no IV
 - **10 mL/kg IV NS** (especially if pale skin, poor perfusion, weak pulse)
- Post-resuscitation care
 - Consider glucose check if hypoglycemic

D10 1 g/kg (5 mL/kg) IV 0.5-1g

If D10 not available, use D25 and reduce concentration to 12.5%

1. Consider glucose check
2. Take a vial of D25
3. Draw up desired amount of glucose in syringe
4. Draw up equal amount of sterile water or sterile saline
5. Mix together and administer 5 mL/kg to patient



Two finger compression

APGAR SCORE	0	1	2
Appearance	Blue/pale	Body pink, hands blue	Pink
Pulse	Absent	Below 100	Above 100
Grimace	None	Grimace	Cough, sneeze, cry
Activity	Flaccid	Some	Active motion
Respiration	Absent	Weak, slow	Good, crying

Calculate APGAR score at 1 and 5 minutes after birth and provide appropriate intervention

References

- Aziz K, Lee HC, Escobedo MB, et al. Part 5: Neonatal resuscitation: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S524–S550.

ORGANOPHOSPHATE POISONING

Definition

- Chemicals, typically insecticides and herbicides, that poison the nervous system of the body

Key points

- Ensure scene safety and barrier precautions
- Identify substance type, amount, and time of ingestion/exposure
- Remove agent: if dry, brush off powder, then flush with water; if liquid, flush with water
- Remove contaminated clothing to prevent continued poisoning ; place in airtight container
- Assess HR, SBP, lung sounds, pupil examination and for the presence of sweating

Serious signs and symptoms

- Salivation, Lacrimation, Urination, Diarrhea, Gastrointestinal motility, Emesis (**SLUDGE**)
- Wheezing
- Respiratory distress
- Seizure
- Bradycardia
- Hypotension

Routine medical care
ABC considerations

CONTACT ERC PHYSICIAN

- Cardiac monitor
- IV access
- Suction excessive secretions
- Oxygen by face mask
- See **Airway management protocol** (Refer page 05) as needed

Serious signs and symptoms

Yes

CONTACT ERC PHYSICIAN

- Atropine 2.4 mg IV bolus (4 vials) each vial 0.6mg
- 500 mL IV NS bolus
- After 5 min, recheck: HR, SBP, lung sounds, pupils, sweating
 - If no improvement after 5 mins give Atropine 4.8 mg IV (8 vials)
- If ongoing seizures, Midazolam 5mg IV or 10mg IM and see **Seizure protocol** (Refer Page 70)

No

Reassessment and continue transport

ERC Physician

Key points

- Organophosphates (OP) are neurotoxins that inhibit cholinesterase and increase acetylcholine at muscarinic and nicotinic cholinergic synapses leading to cholinergic syndrome
- Can be absorbed cutaneously, ingested, inhaled or injected. OPs are well absorbed from the lungs, GI Tract mucus membranes and conjunctiva following inhalation, ingestion or topical contact. Although skin absorption is relatively low highly toxic OPs can still cause severe toxicity.
- Most common cause of death is respiratory failure and hypoxia from respiratory muscle weakness and pulmonary secretions
- Atropine a muscarinic antagonist that reverses poisoning by decreasing secretions, reversing bradycardia/hypotension
- Evidence DOES NOT support the use of charcoal to treat organophosphate poisoning; may be useful if additional ingestions suspected

Prehospital management options

- If severe organophosphate (OP) poisoning
 - 2 large bore Ivs
 - Repeat 500 mL IV NS bolus to keep SBP >90
 - Atropine
 - First dose is 2.4 mg rapid IV push
 - Evaluate after 5 min for 5 parameters: HR, SBP, lung sounds, pupils, sweating
 - If no improvement, double initial dose to 4.8 mg and reevaluate after 5 min
 - Continue to double the atropine dose (2.4mg or 4 vials followed by 4.8mg or 8 vials followed by 9.6 or 16 vials and so on) every 5 min until HR >80 bpm and clear lung sounds with oxygen saturation >94%

Prolonged transport or in hospital management options

- Once improved, consider atropine IV infusion at 10-20% of total atropine given per hour (if total dose given was 16.8 mg or 28 vials then you would start with 1.68mg to 3.4mg or 3-6 vials as IV infusion over 1 hour)
- Monitor for atropine toxicity: agitation, mydriasis, absent bowel sounds, confusion, hyperthermia, urinary retention, tachycardia; stop administration of atropine for 30 min and restart at 70% of prior rate
- Monitor for impending respiratory failure from proximal muscle weakness (particularly neck flexor weakness) with tidal volume or negative inspiratory force at least every 4 to 6 hours.

Pediatrics

Prehospital management options

- Management is similar to adults with following pediatric doses
 - Atropine 0.05 mg/kg IV push (up to 2.4 mg) starting dose, then continue as above**

References

- Eddleston M. Insecticides: Organic Phosphorus Compounds and Carbamates. In: Nelson LS, Howland M, Lewin NA, Smith SW, Goldfrank LR, Hoffman RS. eds. Goldfrank's Toxicologic Emergencies, 11e. McGraw Hill; 2019.

POISONING

Key points

- Ensure rescuer and scene safety
- Identify substance type, amount, and time of ingestion/exposure
- If medication ingestion: record medication name and dose, and bring containers with patient
- Identify past medical history, medications, psychiatric problems, suicide attempts
- *DO NOT* gastric lavage in the ambulance; *DO NOT* induce vomiting

Differential diagnosis

- Infection
- Trauma
- Psychosis
- Stroke
- Hypoglycemia

Serious signs and symptoms

- Pulse >120 or <50
- Respiratory rate <10 or >24
- Difficulty breathing
- Altered mental status
- SBP <90 or >180
- Unprotected airway (no gag reflex)

Routine Medical care

ABCs emphasizing breathing

- High flow oxygen if inhalation exposure

CONTACT ERC PHYSICIAN

Able to protect airway

No

See *Airway management protocol* (Refer Page 5)

Yes

EMRI GREEN HEALTH SERVICES

Breathing Normal

No

Evaluate for opioid toxidrome
See opioid Poisoning Protocol
(Refer Page 52)

Yes

Circulation Normal (SBP >90mmHg)

No

IV access - IV Fluids 500ml NS Bolus

Yes

Check GRBS (>80mgdl)

No

Follow hypoglycemia
protocol (Refer page 48)

Yes

If seizures

Yes

See seizures protocol
(Refer page 70)

No

Reassessment and continue transport

EMRI GREEN HEALTH SERVICES

ERC Physician

Key Points

- Most toxic ingestions require supportive care only
- If a specific ingestion is identified, see chart below for possible antidotes
- Activated charcoal should be administered as soon as possible after the ingestion (preferably within 1 hour); however, it may be useful beyond 1 hour if the medication is a 'sustained' release formulation
- DO NOT give charcoal for
 - Alcohols: ethanol, ethylene glycol, methanol, others
 - Petroleum products: kerosene, gasoline, oil, others
 - Caustics: acids, bleach, lye
 - Metals: lithium, iron, lead, aluminium, others
 - Pesticides
- Activated charcoal can cause nausea/vomiting, bloating, diarrhea, constipation and severe pulmonary complications (if aspirated)

NG tube aspiration/Gastric lavage should not be done routinely and has very limited utility

Agent	Symptoms (toxicodrome)	Antidotes/Treatment options
Organophosphate pesticides	Salivation, lacrimation, urination, defecation, bradycardia, hypotension	<ul style="list-style-type: none"> • Atropine 2.4 mg IV (initial dose) • 4.8 mg if no response after 5 mins • IV NS bolus for hypotension • See <i>Organophosphate poisoning protocol</i>
Calcium channel blockers	Bradycardia, hypotension	<ul style="list-style-type: none"> • Atropine 0.6 mg IV; repeat every 3-5 min as needed • Glucagon 5 mg IM/IV • Calcium Chloride 1-2 g IV over 10 min • Calcium Gluconate 3-6 g IV over 10 min
Beta blockers	Bradycardia, hypotension	<ul style="list-style-type: none"> • Atropine 0.6 mg IV; repeat every 3-5 min as needed (max dose 0.04 mg/kg) for HR <60, SBP <90 with <i>Serious signs or symptoms</i> • Glucagon 5 mg IM/IV
Narcotics/Opioids	Pinpoint pupils, decreased respirations, altered mental status	<ul style="list-style-type: none"> • Naloxone 0.4-IV/IM; may repeat every 2-3 minutes max 10mg • See opioid <i>overdose protocol</i>
Stimulants (cocaine, amphetamines)	Dilated pupils, tachycardia, hypertension, altered mental status	<ul style="list-style-type: none"> • Diazepam 5 mg IV/IM; repeat every 5-10 min as needed for agitation • Midazolam 2 mg IV/5mg IM; repeat every 5-10 as needed for agitation

References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY 2012.
- Nelson LS, Howland M, Lewin NA, Smith SW, Goldfrank LR, Hoffman RS. Principles of managing the acutely poisoned or overdosed patient. In: Nelson LS, Howland M, Lewin NA, Smith SW, Goldfrank LR, Hoffman RS, eds. Goldfrank's Toxicologic Emergencies. 11th ed. McGraw Hill; 2019.

POSTPARTUM HEMORRHAGE (PPH)

Definition

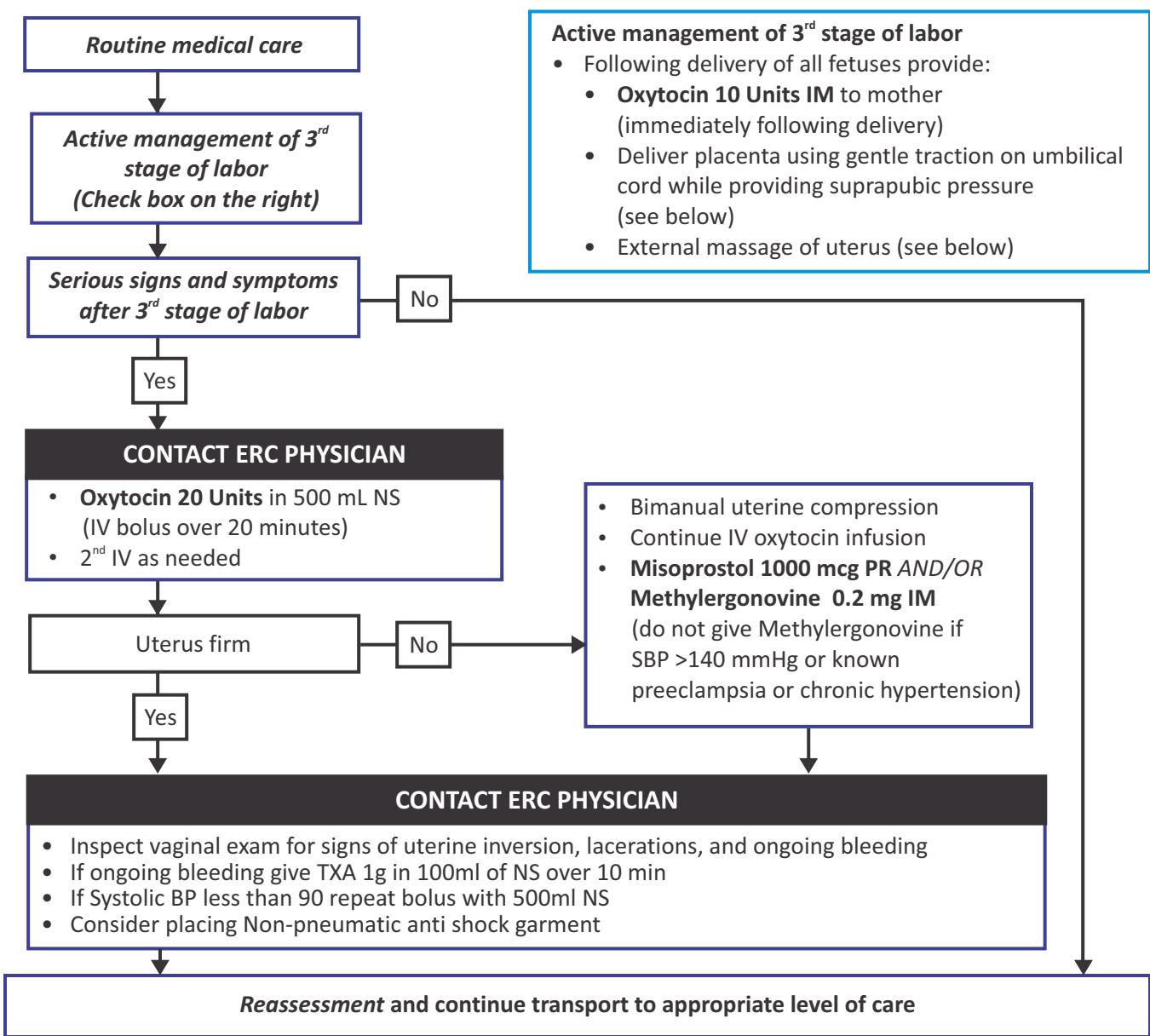
- More than 1000ml or bleeding associated with signs of hypovolemia within 24hrs of birth and regardless of birth route

Key points

- Most common cause of maternal death in developing nations
- Active management of the third stage of labor can prevent 60% of PPH
- Rapidly evaluate for and correct possible causes
- Uterine atony (soft, boggy uterus) is the most common cause of PPH

Serious signs and symptoms

- SBP <90
- HR >100
- Shortness of breath (RR >30)
- Altered mental status
- Cool or moist skin



ERC Physician

Key points

- Decisions on management options should be based on the expected time to hospital arrival
- Ensure patients are transported to a facility with a blood bank, operating theater and Obstetrician

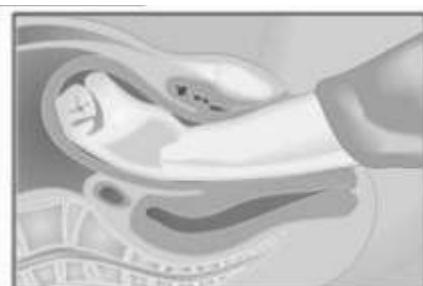
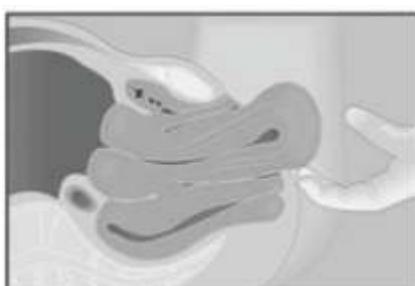
4 T's	Causes	Prehospital treatment
Tone	Decreased uterine tone	1. Uterine massage 2. Oxytocin 3. Misoprostol 4. Methylergonovine
Trauma	1. Cervical/perineal lacerations 2. Uterine inversion	1. Apply direct pressure 2. Restore uterus (see below)
Tissue	Placenta retained	Manual removal if qualified
Thrombin	Decreased clotting	Supportive measures



Bimanual uterine
massage



Placental
tissue removal



Inversion and restoration of uterus

References

- American Academy of Family Physicians. Advanced Life Support in Obstetrics (ALSO) Course Manual. 10th ed. Leawood, KS: American Academy of Family Physicians; 2023.
- World Health Organization. WHO recommendation on tranexamic acid for the treatment of postpartum haemorrhage. Geneva: World Health Organization; 2017.

PREECLAMPSIA/ECLAMPSIA

Key points

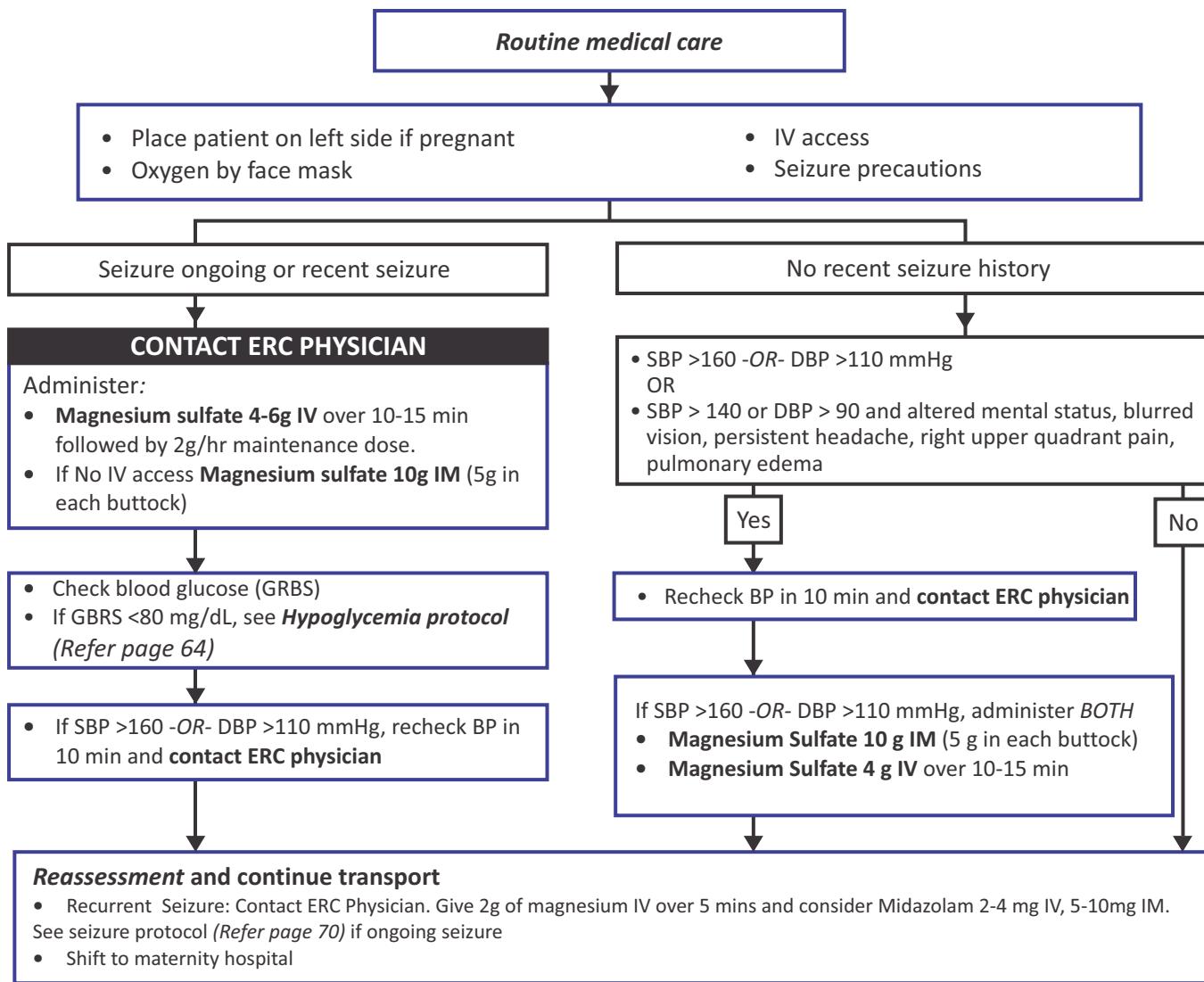
- Preeclampsia and eclampsia can occur from the 20th week of pregnancy until 6 weeks after delivery
- Preeclampsia is a BP $\geq 140/90$ mmHg on >2 readings >6 hours apart AND significant protein in the urine or signs of end organ damage
- Preeclampsia with severe features: **Systolic blood pressure ≥ 160 mmHg and/or diastolic blood pressure ≥ 110 mmHg**, OR SBP $> 140/90$ mmHg and altered mental status, blurred vision, pulmonary edema, RUQ abdominal pain and persistent headache
- Eclampsia is preeclampsia with seizures
- Obtain past medical history: medications, last menstrual period, gestational age (trimester)
- Magnesium toxicity manifests as loss of deep tendon reflexes and respiratory depression

Differential diagnosis

- Epilepsy
- Hypoglycemia
- Trauma/head injury
- Alcohol withdrawal
- Toxins/poisoning/overdose
- Chronic hypertension

Serious signs and symptoms

- Hypoxia/cyanosis
- Shortness of breath
- Seizures
- Altered mental status



ERC Physician

Key points

- The definitive treatment for eclampsia is delivery
- Magnesium should not be used to control hypertension
- Epigastric pain may be a sign of severe preeclampsia (also consider gallbladder disease)

Prehospital management options

- If repeat seizure occurs more than 10 minutes after the initial IV loading dose of magnesium, administer **Magnesium sulfate 2 g IV** over 10-15 minutes
- Respiratory depression may occur with magnesium toxicity
 - **Calcium gluconate 1 g IV** can be given for significant respiratory depression

Prolonged transport or in hospital management options

- If the patient continues to seize after repeat magnesium administration, consider
 - **Midazolam 2-4 mg IV/5-10mg IM**; may repeat x 1 for ongoing seizure
 - Alternate medications:
 - **Diazepam 5 mg IV/IM**; may repeat x 1 for ongoing seizure
- Antihypertensive medications
 - Treat persistent SBP >160 or DBP >110 mmHg (Goal: SBP <160 and DBP <110 mmHg)
 - **Nifedipine 20 mg PO (DO NOT give sublingual)**
 - **Nifedipine 10 mg PO** may be repeated every 30 min to a max of 40 mg
- Alternate medications:
 - **Labetalol 20mg IV followed by 40mg followed by 80mg : every 10 mins escalating doses to obtain goal of SBP <160 mmHg and DBP < 110 mmHg**
- Second line hydralazine and third line is PO Nefidipine
 - **Labetalol 200 mg PO**
 - If BP remains elevated above goal after 30 min, then administer **Labetalol 200 mg PO x 1 additional dose**

How to mix and infuse Magnesium sulfate

- **Magnesium sulfate 4 g:** Mix 4 ampules of 50% MgSO₄ (1 g/ampule) in 100 mL NS
 - Infuse over 10 minutes, 100-150 drops per minute
- **Magnesium sulfate 2 g:** Mix 2 ampules of 50% MgSO₄ (1 g/ampule) in 100 mL NS
 - Infuse over 10 minutes, 100-150 drops per minute

Monitor the patients' vital signs, oxygen saturation, deep tendon reflexes, and level of consciousness every 15 minutes for the first hour, and every 30 minutes for the second hour.

Assess for signs of *magnesium toxicity* (e.g., visual changes, somnolence, flushing, muscle paralysis, loss of patellar reflexes) or pulmonary edema.

References

- American Academy of Family Physicians. Advanced Life Support in Obstetrics (ALSO) Course Manual. 10th ed. Leawood, KS: American Academy of Family Physicians; 2023.
- Okusanya BO, Oladapo OT, Long Q, et al. Clinical pharmacokinetic properties of magnesium sulphate in women with pre-eclampsia and eclampsia. BJOG. 2016;123(3):356–366.

RESPIRATORY DISTRESS (BREATHING PROBLEM)

Key points

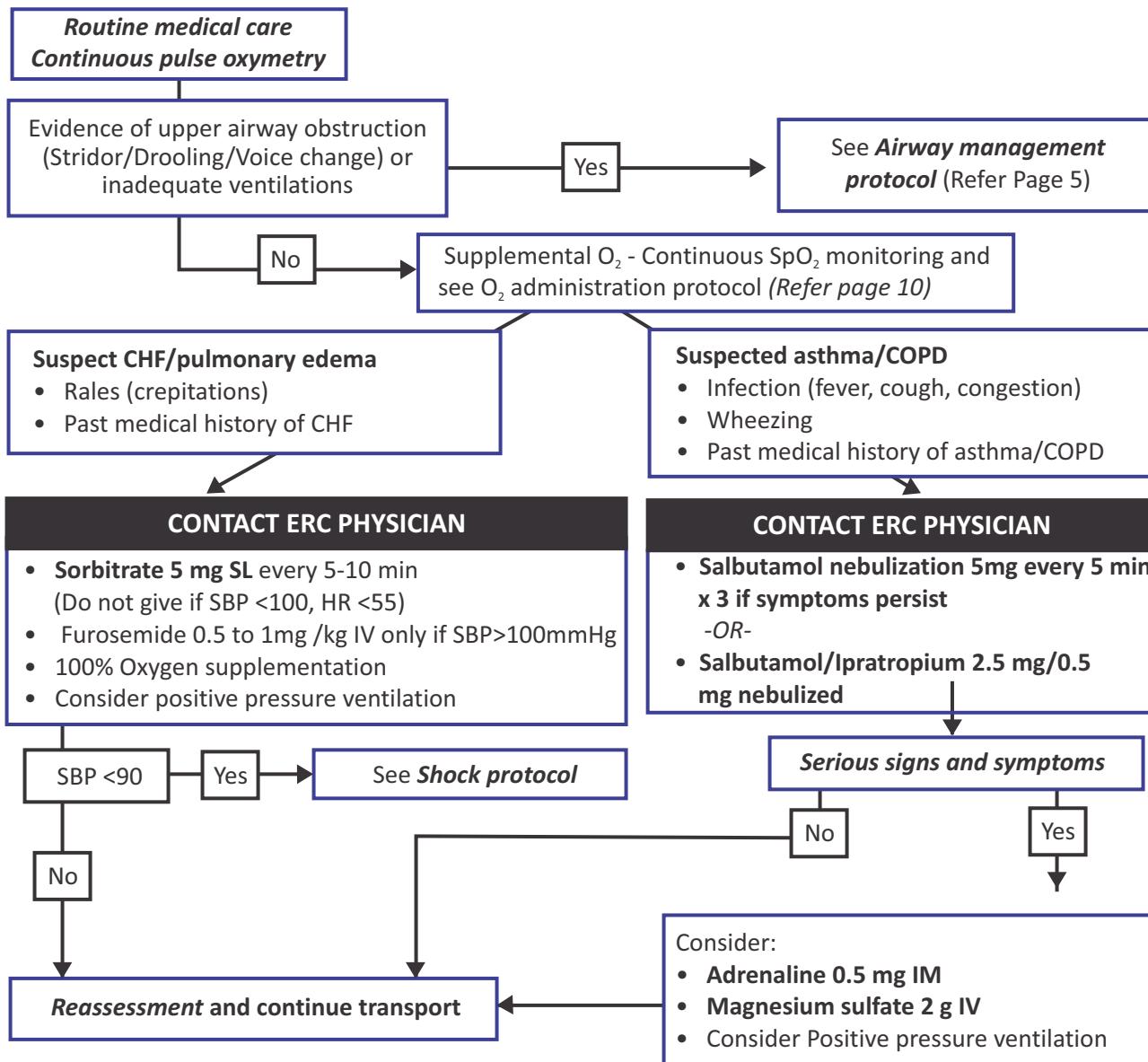
- Use this protocol for
 - Suspected asthma/COPD/CHF/pulmonary edema/LRTI, Covid 19
 - Wheezing
 - Rales (crepitations)
- If suspected, see **Allergic reaction or Airway obstruction protocol**

Differential diagnosis

- See box on following page

serious signs and symptoms

- | | | |
|---|--------------------------------|-------------------------|
| • RR >30 | • Inability to speak sentences | • Cyanosis |
| • Heart Rate: >110 | • Altered mental status | • SpO ₂ <95% |
| • Needing to sit up and lean forward to breathe (tripod position) | | • Poor air movement |



ERC Physician

Key points

- Goal is to identify and treat underlying diagnosis (see **Differential diagnosis** below)
- Fluid over load / pulmonary edema may present with wheezing

Prehospital management options

- Oxygen
- **Pulmonary edema** apply O₂ for patients with SPO₂ <95%
 - **Sorbitrate 5 mg SL** every 5-10 min x 3
 - Nitrates are first line therapy for CHF/pulmonary edema
 - *DO NOT* give if the patient has taken Viagra/Levitra/Cialis (PDE-5) in the previous 36 hours
 - **Furosemide (Lasix) 0.5-1 mg/kg IV**; hold if SBP <100 mmHg
 - Positive pressure ventilation (O₂ to be administered by nasal canula prior to PPV)
- **Bronchospasm or wheezing**
 - Asthma/COPD suspected
 - May repeat **Salbutamol 5 mg in 5 mL nebulized NS**
 - Exercise caution when using adrenaline in patients at a high risk for ACS
 - Anaphylaxis suspected, see **Allergic reaction/Anaphylaxis protocol** (Refer Page 18)

Differential diagnosis

- | | | |
|----------------------|---------------------|---------------------|
| • Asthma | • Pulmonary embolus | • Dysrhythmia |
| • COPD | • Pneumothorax | • Anemia/blood loss |
| • Pneumonia | • CHF | • Shock/acidosis |
| • Airway obstruction | • Pleural effusion | • Allergic reaction |

Pediatrics

Key points

- Asthma is the most common cause of respiratory distress followed by respiratory infections
- Cardiac causes (CHF, myocarditis, congenital heart disease, pericarditis) are not common

Prehospital management options

- **Salbutamol 2.5 mg in 5 mL nebulized**
- Consider **Adrenaline (1:1000) 0.01 mg/kg IM** to max of 0.3 mg if asthma suspected
Sample calculations: (20kg child = .2mg adrenaline = .2ml)

References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY 2012.
- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.

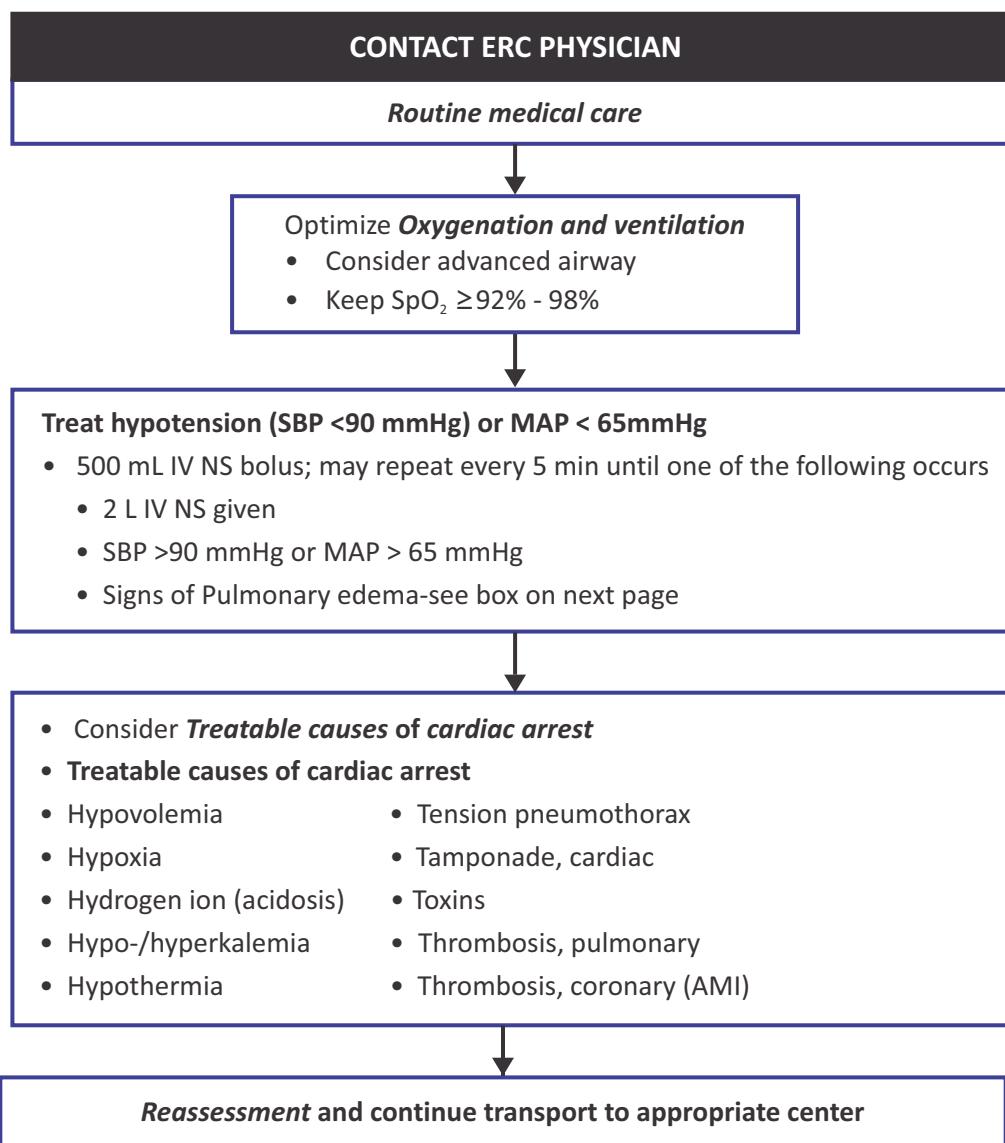
RETURN OF SPONTANEOUS CIRCULATION

Definition

- Return of circulation (pulses) after a cardiac arrest

Key points

- Do not hyperventilate (start at 10 breaths/min)
- Prehospital treatable causes of cardiac arrest**
 - Hypovolemia, hypoxia, hypothermia, tension pneumothorax



ERC Physician

Prehospital management options

Oxygenation and ventilation

- AVOID hyperventilation as this decreases venous return and circulation - ventilate at 10 BPM or 1 breath every 6 seconds.
- SpO₂ goal is 92-98%; hyperoxygenation is possibly harmful

Prolonged transport and in hospital management options

- Vasopressors if SBP <90 MAP >65 after IV fluid administration or **Signs of Pulmonary edema**
 - Adrenaline 2-10 mcg/min IV (infusion by pump)
 - Dopamine 5-20 mcg/kg/min IV (infusion by pump)
 - Noradrenaline 1-30 mcg/min IV (infusion by pump)

Signs of Pulmonary edema

- Difficulty breathing
- Frothy (bubbly) lung fluid
- RR >30
- SpO₂ <94%
- Crepitations
- Wheezing

High suspicion of AMI

- History of AMI
- ST elevation, ST depression, or left bundle branch block on ECG
- Chest pain prior to cardiac arrest

Pediatrics

Key points

Oxygenation and ventilation

- Bag-mask ventilation is appropriate
- Avoid hyperventilation
- SpO₂ goal 94-99%

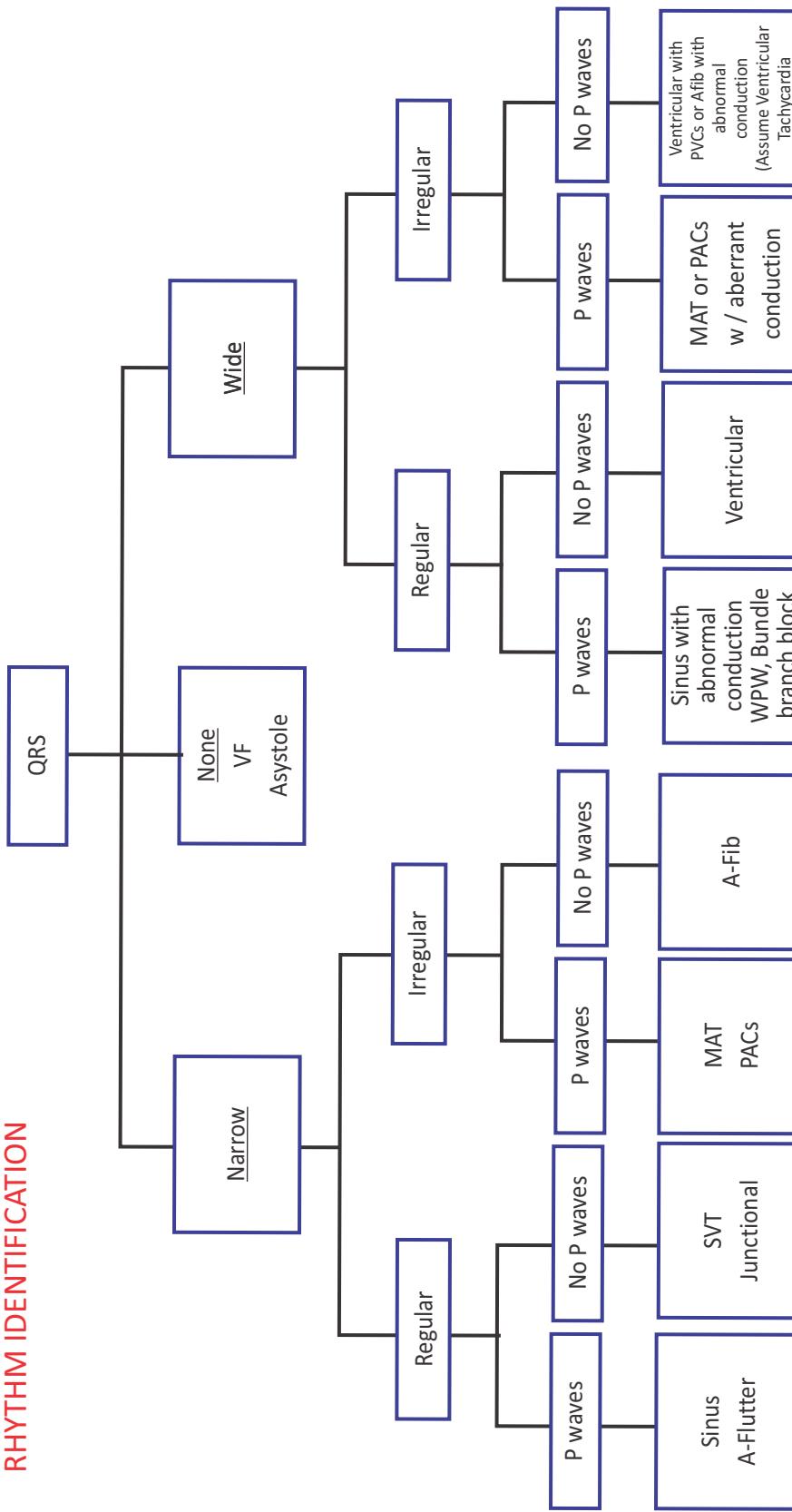
Prehospital management options

- IV fluids: Give 20 mL/kg IV NS bolus; may repeat until
 - Hypotension is improved -OR-
 - 60 mL/kg NS given -OR-
 - Patient develops **Signs of Pulmonary edema** (use age appropriate respiratory rate)
- Vasopressors
 - Adrenaline 0.1-1 mcg/kg/min IV (infusion by pump)
 - Noradrenaline 0.1-2 mcg/kg/min IV (infusion by pump)
 - Dopamine 2-20 mcg/kg/min IV (infusion by pump)

References

- Panchal AR, Bartos JA, Cabañas JG, et al. Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S366–S468.
- Topjian AA, Raymond TT, Atkins D, et al. Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S469–S523.
- ILCOR ALS Task Force. Temperature Management in Adult Cardiac Arrest: Advanced Life Support Systematic Review. ILCOR.org. Published August 30, 2021. Accessed May 7, 2025. <https://costr.ilcor.org/document/systematic-review-temperature-management-in-adult-cardiac-arrest-als>

RHYTHM IDENTIFICATION



- Step 1:Determine rate
 - Step 2:Determine if QRS is narrow, wide, or not present
 - Step 3:Determine if rhythm is regular or irregular
 - Step 4:Determine if P waves are present or absent
 - Step 5:Confirm whether all P waves are followed by QRS
 - 2nd degree Type 1: Gradually increasing PR interval
 - 2nd degree Type 2: Randomly P waves are not conducted
 - 3rd degree: The P waves are not conducted and there

Clues to specific rhythms

- **Abnormal conduction:** Examples, right bundle branch block (RBBB), left bundle branch block (LBBB), Wolff Parkinson White (WPW)
- **Atrial fibrillation (A-fib):** Most common narrow complex irregular rhythm
- **Atrial flutter:** Sawtooth pattern of P waves. P waves are typically at a rate of approximately 300 per second, seen best in V1
- **Junctional:** Rate typically 50–60 bpm, look for retrograde P waves
- **Multifocal atrial tachycardia (MAT):** 3 or more different types of P waves, rate >100; if HR <100 termed wandering pacemaker
- **Premature atrial contractions (PACs):** Look for abnormal P wave appearance before irregularly spaced beats
- **Premature ventricular contractions (PVCs):** Wide, abnormal appearing QRS; if repeating called bigeminy or trigeminy
- **Sinus:** P wave is upright in lead II and downward in aVR
- **Supraventricular tachycardia (SVT):** Rate >150
- **Ventricular:** Normal ventricular rate 40, if >120 called VT which is an unstable, life-threatening rhythm

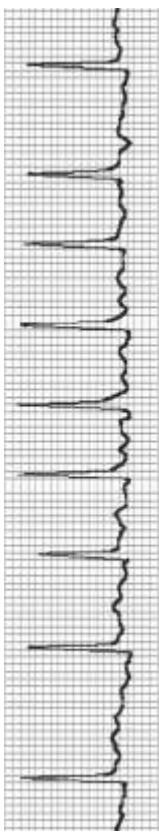


Figure 1. Atrial fibrillation

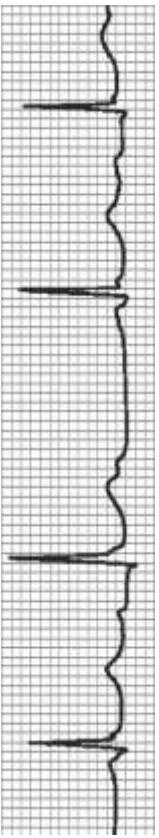


Figure 2. Atrial flutter

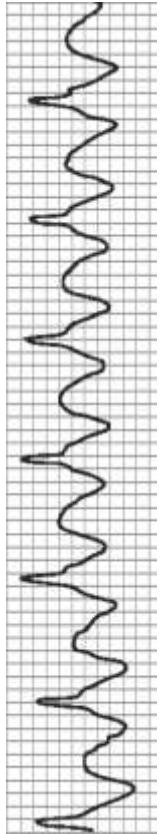


Figure 3. Monomorphic and polymorphic ventricular tachycardia

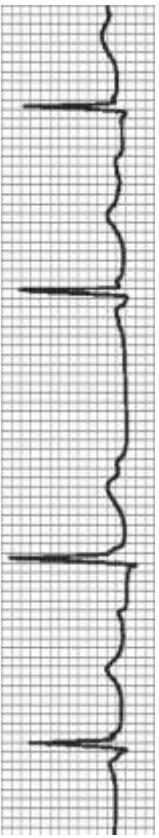


Figure 4. First degree heart block

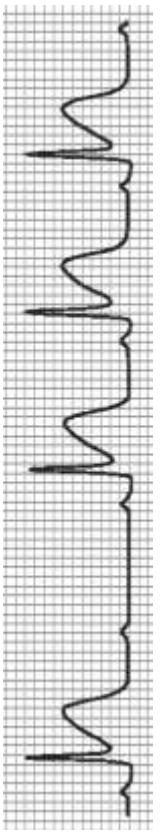


Figure 5. Second degree type 1 heart block

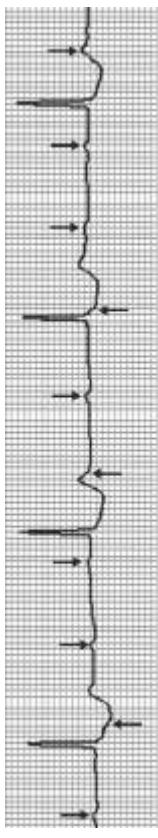


Figure 6. Third degree heart block

References

- Mahadevan SV, Garmel GM (eds). *An Introduction to Clinical Emergency Medicine*, 2nd ed. Cambridge University Press, New York, NY, 2012.

SEIZURES/FITS/CONVULSIONS

Definition

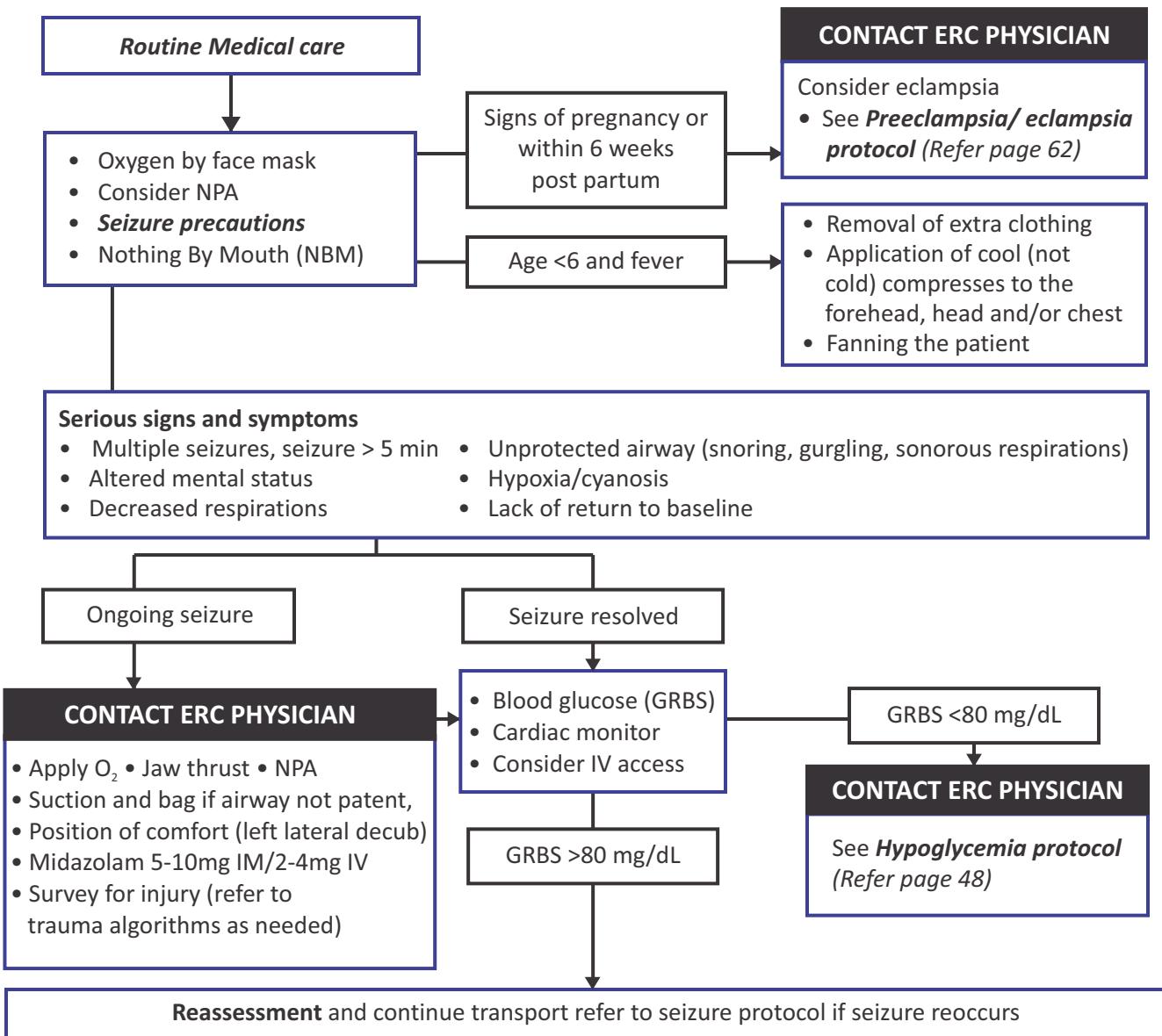
- Sudden change in neurological function often with shaking of the body (see following page for definitions of different types of seizures)
- Status epilepticus is defined as patients with multiple seizure without returning to base line between episodes of seizures OR seizures lasting greater than 5 minutes

Key points

- Obtain past medical history: prior history of seizures, current medications, past medications
- A single seizure prior to EMS arrival may not need medications
- Patients with a seizure >5 min or with 2 or more seizures without returning to their baseline mental status should be treated with anti-seizure medication in the prehospital setting

Differential diagnosis

- | | | | |
|----------------------|----------------------|-------------|------------|
| • Trauma/head injury | • Poisoning/overdose | • Eclampsia | • Epilepsy |
| • Hypoglycemia | • Cardiac arrest | • Stroke | |
| • Infection | • Alcohol withdrawal | • Fainting | |



ERC Physician

Prehospital management options

- If repeat or ongoing seizure following administration of IM midazolam
 - Repeat 10 mg IM dose or give Midazolam 2-4 mg IV, for kids >40 kgs (0.1 mg/kg) every 5 to 10 min until seizure stops (max 8 mg)
 - Alternate medications
 - **Lorazepam 2-4 mg IV/IM every 5 to 10 min (max 8 mg)**

Seizure definitions

- *Simple partial seizures*: Shaking of one part of the body without loss of consciousness
- *Complex partial seizures*: Simple partial seizure, followed by loss of consciousness
- *Absence seizures*: Brief loss of consciousness without motor or sensory involvement
- *Tonic-clonic (generalized) seizures*: Initial contraction of the muscles followed by rhythmic muscle contractions, loss of consciousness, and a postictal state

Seizure precautions

- Place soft padding or move objects away from patient as needed to prevent injury
- Avoid sharp objects (do not place IV in patient with ongoing tonic-clonic seizure)
- Do not forcibly hold down patient
- Do not insert anything into the patient's mouth
- Place the patient into the recovery position after the seizure stops

Pediatrics

Key points

- Most febrile seizures occur in children 6 months to 5 years of age
- Febrile seizures have been divided into two groups, simple or complex. Febrile seizures are considered simple if they met all the following criteria. Generalised full body seizures last less than 15 mins no more than 1 in 24 hrs period.
- Febrile seizures should be treated as non- febrile status
- When cooling a patient, *DO NOT* immerse or submerge the child in a cold bath, and *DO NOT* place ice packs directly on the child's skin.

Prehospital management options

- **IM Midazolam (0.2mg/kg)**
- **Midazolam 0.2 mg/kg IV/IM (max 4 mg);** may repeat x 1 in 5-10 min for ongoing seizure
- **Lorazepam 0.1 mg/kg IV/IM (max 4 mg);** may repeat x 1 in 5-10 min for ongoing seizure
- **Diazepam: Not recommended for infants <30 days**
 - **Diazepam 0.2 mg/kg IV** (slow push) every 10 minutes as needed up to 5 mg
 - **Diazepam 0.2 mg/kg IM** every 10 minutes as needed to 10 mg
 - **Diazepam 0.5 mg/kg PR** up to maximum 10 mg (see directions that follow)
 - Draw up correct quantity of medication into a syringe (filter if using glass ampule)
 - Attach a large bore IV catheter (14 or 16 gauge) and remove needle
 - Insert into patient's rectum and inject the medication
 - Withdraw the catheter and hold patient's buttocks together

References

- Glauser T, Shinnar S, Gloss D, et al. Evidence-based guideline: treatment of convulsive status epilepticus in children and adults: report of the Guideline Committee of the American Epilepsy Society. *Epilepsy Curr.* 2016;16(1):48–61.
- Shah MI, Macias CG, Dayan PS, et al. An evidence-based guideline for pediatric prehospital seizure management using GRADE methodology. *Prehosp Emerg Care.* 2014;18(1):15–24.

SHOCK (NON-TRAUMATIC)

Definition

- Not enough blood flow (perfusion) to meet the needs of the tissues/organs

Key points

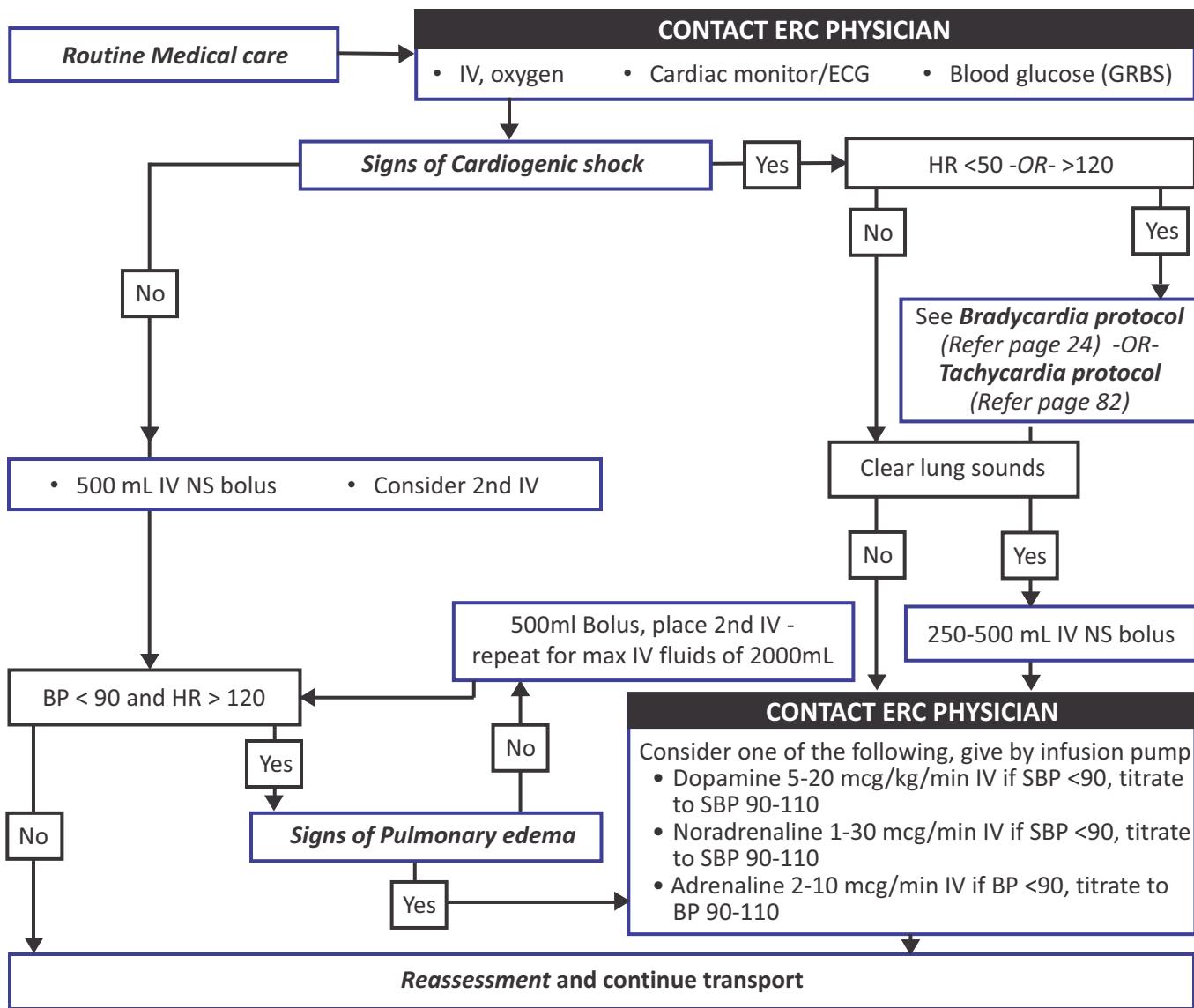
- Most patients with shock benefit from rapid, large volume fluid resuscitation with NS or LR
- Cardiogenic shock** (see table on following page) should be differentiated based on
 - History of CHF, hypertension, or AMI
 - Physical exam revealing **Signs of Pulmonary edema** and leg swelling

Differential diagnosis

- | | | |
|--|--|---------------------|
| • Sepsis (infection) | • Bleeding (GI, trauma, ectopic pregnancy) | • AMI/CHF |
| • Severe allergic reaction | • Medications/poisoning | • Pulmonary embolus |
| • If allergic reaction, trauma, or medication/poisoning see appropriate protocol | | |

Serious signs and symptoms of shock

- | | | |
|----------------|----------------------|-------------------------|
| • HR >120 bpm | • SOB (RR >30) | • Altered mental status |
| • SBP <90 mmHg | • Cool or moist skin | • Cap refill > 4sec |



ERC Physician

Prolonged transport or in hospital management options

- Vasopressor choice: Adrenaline 2-10 mcg/min for IV infusion OR Noradrenaline 1-30 mcg/min OR dopamine 5-20 mcg/kg/min are the first choice for most causes of shock;

Category	Causes	Key signs and symptoms
Hypovolemic	Trauma Dehydration/3 rd space loss Nontraumatic hemorrhage - insensible losses, GI respiratory	<ul style="list-style-type: none"> History of fluid loss or inadequate intake (e.g., bleeding, vomiting)
Distributive	Sepsis Anaphylaxis (allergic reaction) Spinal cord injury	<ul style="list-style-type: none"> Wide pulse pressure Warm flushed skin Warm extremities
Cardiogenic	AMI Hypertension Dysrhythmia Medications/poisoning (beta blockers)	<ul style="list-style-type: none"> Tachypnea with increased respiratory effort secondary to pulmonary edema (refer below) Jugular venous distension Cool extremities
Obstructive	Cardiac tamponade Tension pneumothorax Pulmonary embolus	<ul style="list-style-type: none"> Distended neck veins Unilateral decreased or absent breath sounds (tension pneumothorax)

Signs of Pulmonary edema: difficulty breathing, frothy lung fluid, SpO₂ <94%, crepitations, RR >30

Early signs of shock: rapid RR or HR, cool/moist skin, decreased urination, capillary refill >3 sec

Late signs of shock: altered mental status, weak pulses, SBP <90 mmHg

Pediatrics

Key points

- Use age appropriate vital signs (see **Vital signs protocol**) (Refer page 12)
- A low BP is a late finding of shock; look for other **Early and Late signs of shock**
- Most children have non-cardiogenic shock; give NS or LR in 20 mL/kg boluses until improved or until they have received 60 mL/kg total

Prolonged transport or in hospital management options

- Adrenaline 0.1-1 mcg/kg/min IV** (infusion by pump)
- Noradrenaline 0.1-2 mcg/kg/min IV** (infusion by pump)

References:

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY 2012.
- Los Angeles County Emergency Medical Services Agency. Shock/Hypotension (Reference No. 1207). In: Prehospital Care Manual. Updated October 1, 2024. Accessed May 7, 2025. https://file.lacounty.gov/SDSInter/dhs/1040509_1207Shock-Hypotension.pdf
- Topjian AA, Raymond TT, Atkins D, et al. Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S469–S523.

SMOKE INHALATION

Definition

- Smoke inhalation can result in airway injury as well as cyanide and carbon monoxide toxicity

Key points

- Patients rescued from closed space fires have high risk for toxicity - shift to burn center
- Suspect injury/toxicity with fire accidents at homes, buildings, cars, forests, plastic (cyanide), industrial accident (cyanide)
- Ensure scene safety; avoid fire and building collapse to protect yourself; wear masks and gloves then, remove victim from the source of exposure
- Manage the airway early
- Assess and treat for thermal burns and/or traumatic injuries (consider c-spine immobilization)

Serious signs and symptoms

Airway injury

- SOB, Soot in nose, mouth
- Facial burns
- Hoarse voice
- Stridor
- Swelling to nose, lips, tongue

Cyanide

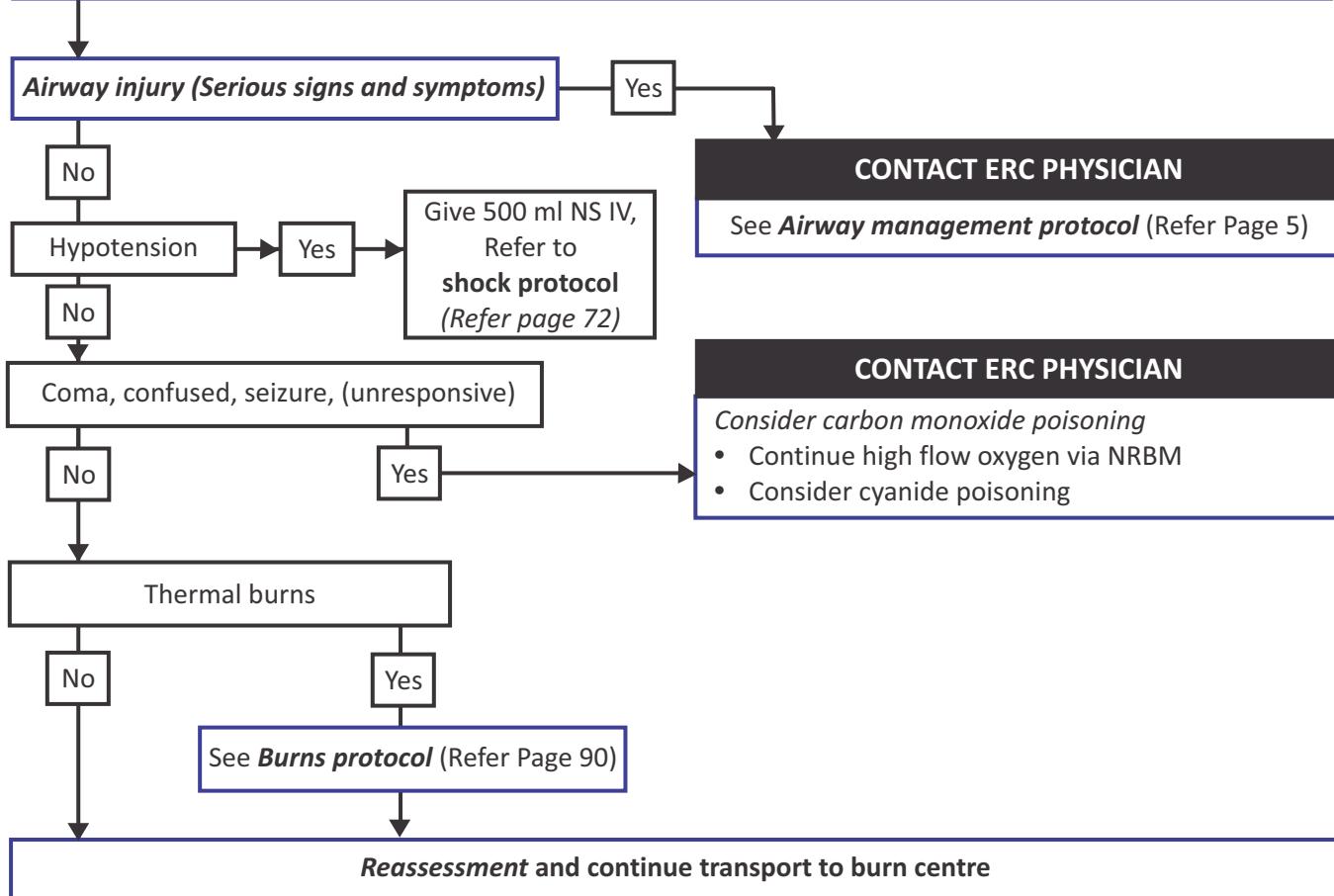
- SOB, Headache
- Weakness, lethargy
- Confusion, seizure
- Coma (unresponsive)
- Hypotension

Carbon monoxide (CO)

- SOB, Headache, dizziness
- Weakness, lethargy
- Confusion, seizure
- Coma (unresponsive)

Routine Trauma care

- Scene safety wear mask gown gloves**
- High flow oxygen via NRB



ERC Physician

Key points

- *Carbon monoxide (CO) poisoning*
 - CO poisoning can make pulse oximetry measures normal when blood oxygen is low.
 - Oxygenation should be assessed by cooximetry because arterial blood gas analysis and pulse oximetry may be inaccurate in CO poisoned patients
- *Cyanide poisoning*
 - Other symptoms include abdominal pain, nausea and vomiting
 - Hydrogen cyanide gas may smell and taste like bitter almonds

Prehospital management options

- *Carbon monoxide (CO) poisoning*
 - Treat if suspecting CO poisoning and serious signs and symptoms
 - High flow oxygen is the most important therapy
 - Decreases the half life of CO
 - Shift to a hospital with a hyperbaric chamber (if available)
 - prevents or lessens brain damage if hyperbaric therapy is started within 6 hours postexposure
- *Cyanide poisoning*
 - Consider treating if suspecting cyanide poisoning and **Serious signs and symptoms**
 - Administer **BOTH** of the following
 - **Hydroxocobalamin (cyanokit) adult 5g by IV Infusion over 15 mins max 10g**
 - Second dose may be required 10 mins after 1st dose if symptoms do not rapidly improve.
 - **Sodium thiosulfate 25% 50 mL (12.5 g) IV or 1.65 mL/kg (max 50 mL) (If available)**
 - May cause vomiting, psychosis, and joint pain

Pediatrics

Key points

- Carbon monoxide poisoning symptoms can be subtle

Prehospital management options

- *Carbon monoxide poisoning*
 - High flow oxygen
- *Cyanide poisoning*
 - **Hydroxocobalamin 70 mg/kg IV (max dose 5g)**
 - **Sodium thiosulfate 25% 1.65 mL/kg (up to 50 mL)**

References

- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.

STROKE

Definition

- Brain damage due to blockage of blood flow (ischemic stroke) or bleeding (hemorrhagic stroke)

Key points

- Thrombolysis can be considered up to 4.5 hrs
- Establish the time that the patient was last seen acting normal
- Sudden onset of symptoms is concerning for stroke

Differential diagnosis

- | | | |
|----------------|----------------|---------------------|
| • Infection | • Trauma | • Seizure |
| • Hypoglycemia | • Intoxication | • Aortic dissection |
| | | • Migraine |

Serious signs and symptoms

- | | | | |
|---------------------------|----------------------|----------------|-------------------|
| • Focal weakness/numbness | • Difficult speaking | • Facial droop | • Headache |
| • AMS/confusion | • Dizziness | • Paralysis | • Vision problems |

Routine medical care

- Airway management protocol (Refer page 05) as needed
- Nothing By Mouth (NBM)
- Blood glucose (GRBS)
- Establish last time seen normal
- Cardiac monitor
- High flow oxygen (maintain SpO₂>95% if hypoxic)
- IV access

GRBS <80 mg/dL

CONTACT ERC PHYSICIAN

- Dextrose 25 g IV bolus
- Hypoglycemia protocol (Refer page 48)
- Recheck Blood glucose

GRBS >80 mg/dL

- Establish *Cincinnati prehospital stroke scale*
 - Facial droop-yes/no
 - Arm drift-yes/no
 - Abnormal speech-yes/no

CONTACT ERC PHYSICIAN

- See *Altered mental status protocol* (Refer Page 74) if needed

- Reassessment and continue transport to stroke center
- All patients with positive stroke scale or suspected stroke and last known normal <24hrs or unknown last known normal should be transported to a stroke center

ERC Physician

Key points

- If 'yes' to any question in the **Cincinnati prehospital stroke scale**, consider shifting the patient to a stroke center for possible thrombolytic therapy

Cincinnati prehospital stroke scale

Facial droop: Have the patient smile or show his or her teeth

- Normal: Both sides of face move equally (*0 points*)
- Abnormal: One side of face does not move as well as the other (or at all) (*1 point*)

Arm drift: Have the patient close his/her eyes and hold his/her arms straight out in front for 10 sec

- Normal: Both arms move equally or not at all (*0 points*)
- Abnormal: One arm does not move, or one arm drifts down compared with the other (*1 point*)

Speech: Have the person say a simple, familiar saying

- Normal: Patient uses correct words with no slurring (*0 points*)
- Abnormal: Slurred or inappropriate words or mute (*1 point*)

Normal: *0 points* Abnormal: *1, 2, or 3 points*

References

- Powers WJ, Rabinstein AA, Ackerson T, et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke. *Stroke.* 2019;50(12):e344–e418.
- Cronin CA, Sheth KN, Zhao X, et al. Adherence to Third European Cooperative Acute Stroke Study 3- to 4.5-hour exclusions and association with outcome: data from Get With The Guidelines—Stroke. *Stroke.* 2014;45(9):2745–2749. doi:10.1161/STROKES.114.005443

SUBMERSION/NEAR DROWNING

Definitions

- Respiratory impairment due to submersion or immersion in liquid

Key points

- DO NOT* attempt water rescue if scene unsafe
- Note temperature of submersion fluid and length of time submerged
- Assume head/neck trauma
- DO NOT* perform abdominal thrusts (Heimlich maneuver), which increase the risk of vomiting and aspiration
- If respiratory arrest is suspected, begin ventilations in the water
- If cardiac arrest, chest compressions cannot be done in water
 - No spine injury: Immediately move patient from water and begin CPR
 - Possible spine injury: Stabilize, remove, then begin CPR

Serious signs and symptoms

- | | | |
|------------------------|-------------------------|---------|
| • Respiratory distress | • Nausea/vomiting | • Shock |
| • Airway secretions | • Altered mental status | |

Routine Medical / Trauma care

- If pulseless initiate CPR. (See CPR protocol Refer page 26)*
- Oxygen by face mask - See oxygen administration protocol (Refer page 10)
- Pulse oximetry
- Remove wet clothing
- if temperature < 36C consider Hypothermia Protocol (Refer page 50)

SpO₂<94%

-OR-

Serious signs and symptoms

Yes

CONTACT ERC PHYSICIAN

- Airway management protocol as needed see oxygen administration protocol (Refer page 10)
- IV access, apply O₂ and see shortness of breath protocol (Refer page 64)

Reassessment and continue transport

- Consider Spinal immobilization if anyone of the following:
- Significant mechanism for cervical spine injury
- Significant distracting injury
- Shift to trauma hospital
- Altered mental status
- Focal neurological deficit
- See specific **Trauma protocols** based on suspected injury

ERC Physician

Key points

- Lung injury occurs when a person is submerged in water, attempts to breathe, and either aspirates water or water causes laryngospasm causing hypoxia without aspiration
- Drowning causes hypoxemia and acidosis which can progress to multi-organ system failure

References

- Olshaker JS. Submersion. *Emerg Med Clin North Am*; 2004; 22(2): 357-67.
- Mahadevan SV, Garmel GM (eds). *An Introduction to Clinical Emergency Medicine*, 2nd ed. Cambridge University Press, New York, NY 2012.
- Mejia A, Elling B, Aehlert B, eds. *Nancy Caroline's Emergency Care in the Streets*. 9th ed. Jones & Bartlett Learning; 2022.
- Szpilman D, Bierens JJLM, Handley AJ, Orlowski JP. Drowning. *N Engl J Med*. 2012;366(22):2102–2110.
[doi:10.1056/NEJMra1013317](https://doi.org/10.1056/NEJMra1013317).

SYNCOPE OR NEAR SYNCOPE

Definition

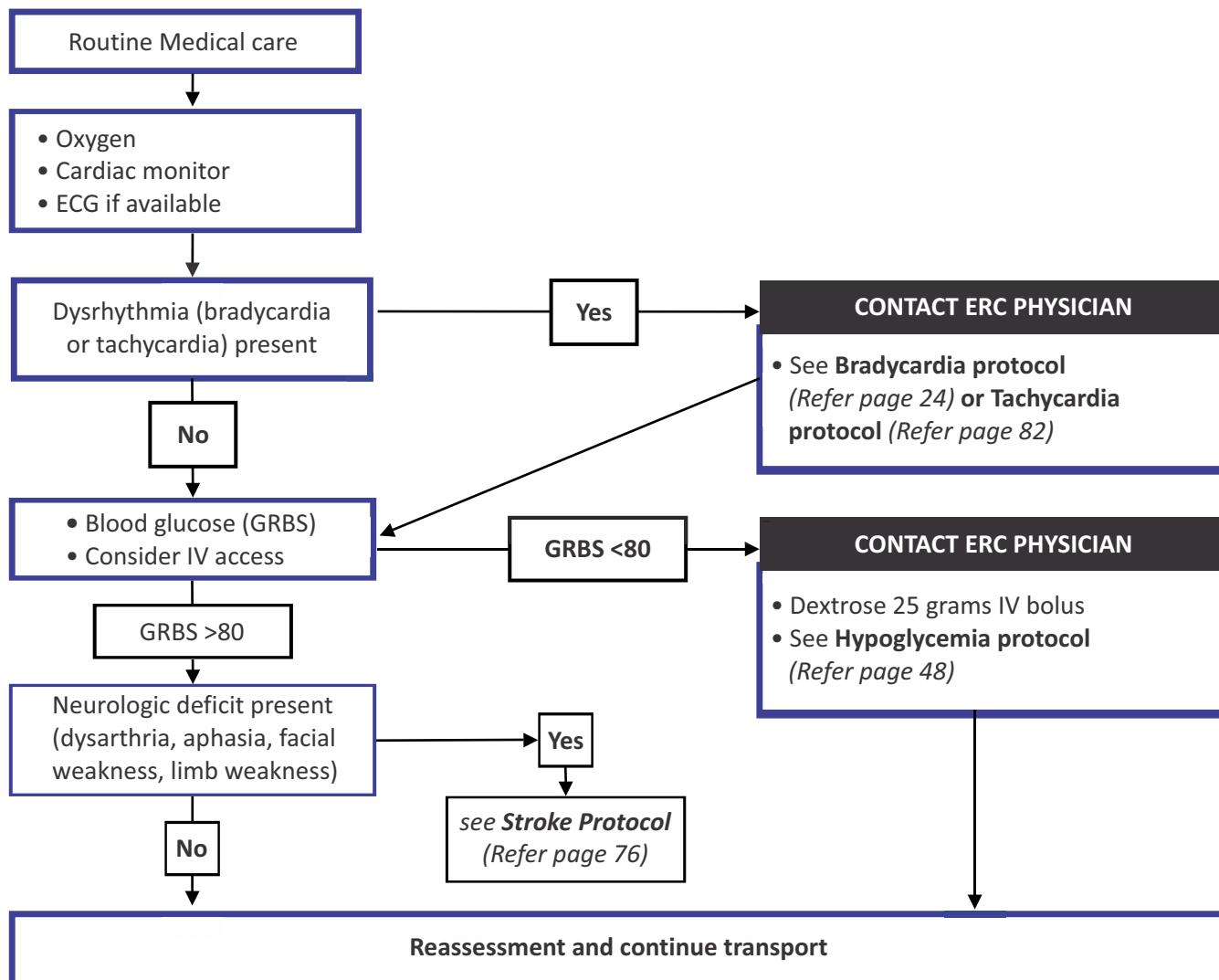
- Brief loss of consciousness or severe giddiness

Key points

- Monitor for cardiac dysrhythmias
- May be difficult to distinguish from seizures/fits
- Always consider trauma, and place patient in cervical spine precautions as needed

Differential diagnosis

- | | | |
|-----------------------------------|---|--|
| • Dysrhythmia | • Orthostasis (blood loss, dehydration) | • Pulmonary embolus |
| • Hypoglycemia | • ACS | • AAA/ectopic pregnancy |
| • Vasomotor (vasovagal) | • Shortness of breath | • Seizure |
| Serious signs and symptoms | • Headache | • Altered mental status/neurologic deficit |
| • SBP <90 | | • Sudden abdominal/back pain |
| • Chest pain | | |



ERC Physician

Key points

- Consider stroke vs intracranial hemorrhage (NIHSS, neurologic deficit, sudden onset headache) and if concerned recommend transport to appropriate level of care --- Lower priority than cardiac evaluation and glucose check
- An abnormal ECG is the most important predictor of cardiac causes of syncope, dysrhythmias and adverse outcomes
- Obtain ECG if available to check for signs of
 - *Dysrhythmias*: tachydysrhythmias, bradydysrhythmias and AV blocks
 - Wolff-Parkinson-White syndrome: short PR interval in combination with a slightly prolonged QRS interval and delta waves
 - QT prolongation (> 475 msec)
 - Hypertrophic cardiomyopathy: large-amplitude QRS complexes, tall R waves in the right precordial leads, and deep narrow Q waves in the inferior or lateral leads
 - Brugada syndrome: complete or incomplete right bundle branch block pattern with ST-segment elevation in the right precordial leads
 - *Pulmonary embolus*: sinus tachycardia, inverted T waves (especially in the right precordial leads), a rightward axis, Q waves in lead III, and tall R waves in lead V1-S1Q3T3
 - ACS: ST-segment elevation or depression, inverted T waves, or new intraventricular conduction abnormalities or bundle branch blocks
 - *Pericardial tamponade*: tachycardia plus low QRS voltage; electrical alternans is present in one-third of cases

Differentiating syncope from seizure

- Syncope patients (as compared with seizure patients) should
 - Return to normal mental status in <5 minutes (no postictal period)
 - Rarely defecate or urinate during the episode
 - Not have prolonged shaking (>15 seconds)
 - Unlikely to have tongue biting

Pediatrics

Key points

- The most common causes of syncope in children are vasomotor (vasovagal), breath-holding spells and orthostasis (dehydration)
- Life-threatening causes of syncope are generally cardiac, including primary electrical disturbances and structural heart disease
- Children <1 year of age should be brought to the hospital for evaluation of a possible BRUE (*Brief Resolved Unexplained Event*) which usually involves some combination of apnea, color change (cyanosis, pallor, or plethora), change in muscle tone (limp or stiff), choking or gagging
- Exercise-induced syncope in children is concerning for a structural problem with the heart such as hypertrophic cardiomyopathy
 - Ask about a family history of early cardiac death

References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY 2012.
- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.

TACHYCARDIA

Definition

- HR >120 beats/minute (HR 100-120 bpm rarely signifies a cardiac problem due to dysrhythmia)

Key points

- Unstable tachycardia: for a rapid HR to cause hemodynamic instability, it is usually >150 bpm
- Sinus tachycardia: treat the cause of the rapid HR, not the elevated HR
- Consider IV access and pre-cardioversion sedation in the awake patient
 - *Do not delay cardioversion for highly unstable patients*
 - Use caution when giving sedative agents to patients with SBP <90

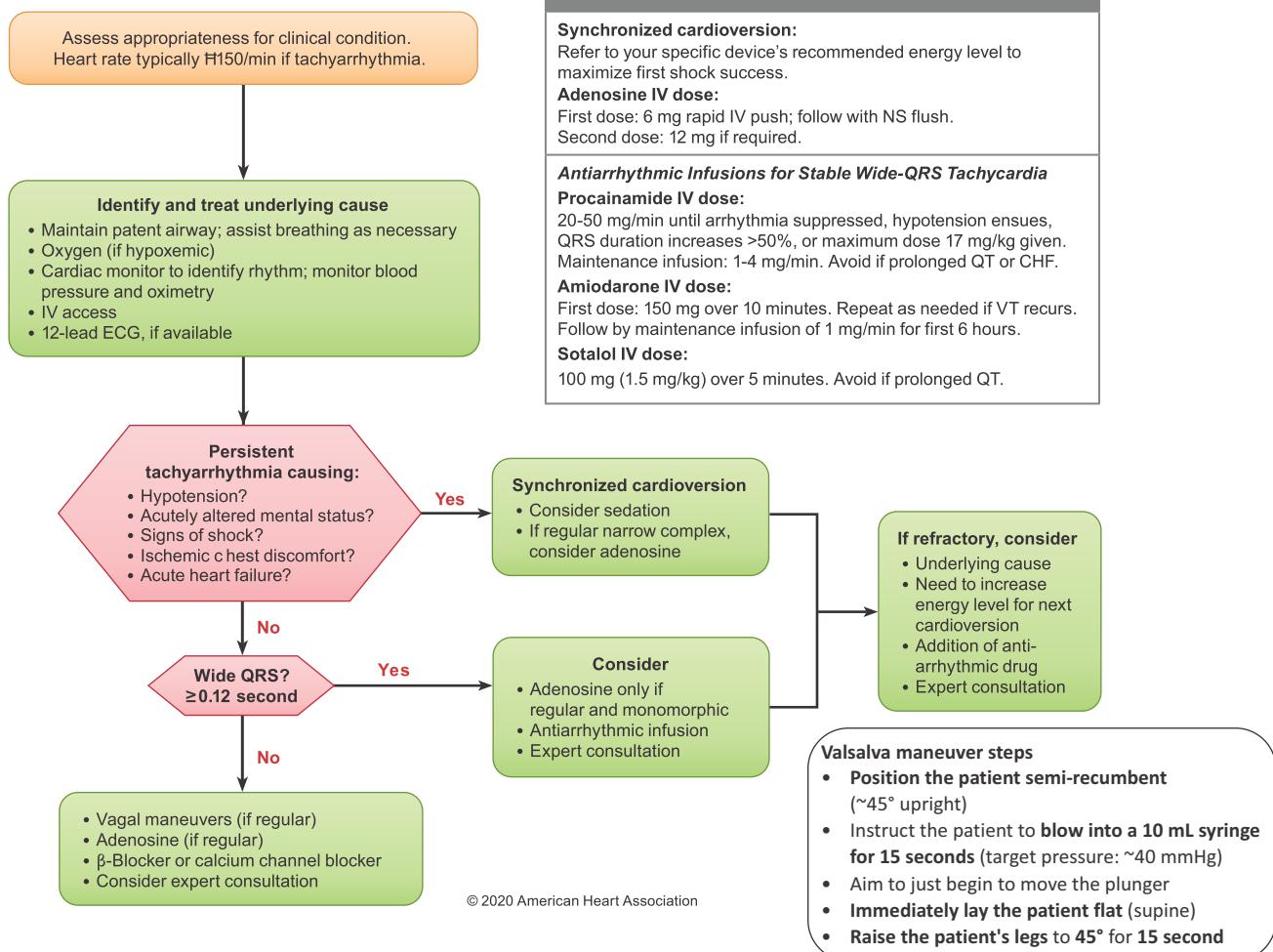
Differential diagnosis

- Ventricular tachycardia (VT)
- Supraventricular tachycardias (SVTs)
- Rapid HR due to sepsis, bleeding, pain, dehydration, or other causes
- Atrial fibrillation/atrial flutter
- Other cardiac dysrhythmias

Serious signs and symptoms

- | | | |
|------------------|-------------------------|----------------------------|
| • Chest pain | • Shortness of breath | • SBP <90 |
| • Cool/pale skin | • Altered mental status | • Wide complex tachycardia |

Adult Tachycardia With a Pulse Algorithm



ERC Physician

Key points

- **Wide Complex Tachycardia**
 - If etiology uncertain, treat as VT; VT QRS duration often >140 milliseconds
 - Although the AHA algorithm above considers Adenosine in case of wide complex tachycardia when regular and monomorphic, avoid adenosine in all wide complex tachycardias to avoid confusion. Treat as VT.
 - If unresponsive to cardioversion, consider Amiodarone
 - **Amiodarone 150 mg IV** over 10 min, then 1 mg/min infusion
 - 500 mL IV NS bolus; use caution if **Signs of Pulmonary edema**
 - Consider repeat cardioversion attempt after anti-dysrhythmic
 - If responsive to electrical cardioversion consider
 - **Amiodarone 150 mg IV** over 10 min, then 1 mg/min infusion
- **Narrow Complex Tachycardia**
 - SVT: Consider **Adenosine 6 mg IV** fast push followed by rapid saline flush; if no effect, repeat **Adenosine 12 mg IV** push followed by saline flush after 2 minutes.

Cardioversion: (Consider sedation before cardioversion (if qualified) with

Midazolam 1-2mg IV in a conscious patient)

- **Synchronized:** Indicated when pulses present
 - Initial energy dose
 - Narrow or wide and regular: 100 J monophasic; 100 J biphasic
 - Narrow and irregular: 200 J monophasic; 120-200 J biphasic
 - Wide and irregular: defibrillate (not synchronized)
- **Unsynchronized:** Indicated when no pulses, polymorphic VT, delay in synchronization
 - Initial energy dose: 200 J biphasic; maximum on defibrillator

Pediatrics

Key points

- Use age appropriate vitals (see **Vital signs protocol**) (Refer page 12)
- In children, rapid HR alone is rarely the cause of instability; it often results from another illness
- Treatment should focus on good oxygenation, ventilation, and rapid administration of 20 mL/kg IV NS bolus (may repeat up to 60 mL/kg)
- SVT: most common dysrhythmia in children
 - <1 year of age: sinus tachycardia usually <220 bpm, SVT usually >220 bpm
 - >1 year of age: sinus tachycardia usually <180 bpm, SVT usually >180 bpm
- VT (in children) is rare, regular, and >140 bpm, with a QRS >0.08 seconds
- Cardioversion/defibrillation: 2-4 J/kg with monophasic or biphasic

References

- Panchal AR, Bartos JA, Cabañas JG, et al. Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S366-S468.
- Topjian AA, Raymond TT, Atkins D, et al. Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S469-S523.

VAGINAL BLEEDING

Definition

- Excessive or prolonged bleeding from the vagina

Key points

- Determine if the patient is pregnant
 - Key history: trimester of pregnancy, last menstrual period, estimated gestational age
 - See **Calculation of gestational age**
- Bring clots or tissue with patient to the hospital
- DO NOT** perform a vaginal examination in the field

Differential diagnosis:

- | | | |
|-----------------------|--------------------------------------|-------------------|
| • Ectopic pregnancy | • Complicated child birth | • Placenta previa |
| • Placental abruption | • Miscarriage with hemorrhagic shock | |
| • Trauma | • Postpartum hemorrhage | |

Serious signs and symptoms

- | | | |
|----------------------|-------------------------|-------------------|
| • Shock or dizziness | • Altered mental status | • Rapid breathing |
| • Cool, sweaty skin | • Cap refill > 4 secs | • Severe pain |

Routine Medical care

- Place in lateral recumbent position if pregnant
- Oxygen by face mask
- IV access

SBP <90, HR >100

-OR-

Serious signs and symptoms

Yes

CONTACT ERC PHYSICIAN

- 2nd large bore IV
- IV fluids NS 500 ml bolus
- TXA if available (Contraindicated in pregnancy).
- See **shock protocol** (Refer Page 72)

No

Active Labor
Abdominal/back pain, gush of fluid, minutes between contractions

Yes

- See **Childbirth protocol** (Refer Page 32)

No

Postpartum

see postpartum protocol (Refer Page 60)

Yes

- Reassessment and continue transport**
- Shift to maternity hospital

ERC Physician

Key points

- Pregnant patients or those with suspected pregnancy should be transported to a maternity hospital with emergent OB-Gyn capabilities.
- Patients with vaginal bleeding and serious signs/symptoms should be transported to facility with blood bank

Prehospital management options

- **Pain control**
 - Opiate medications are considered safe in pregnancy
 - **Paracetamol 1000 mg IV**
 - **Tramadol 25-50 mg IV** as needed for severe pain; do not give if SBP <90 or RR <12; may repeat every 15 min as needed for further pain control (max 100 mg)
 - **TXA (Tranexamic Acid)** if available.
 - Indications: severe bleeding with systolic blood pressure of <90 and/or heart rate > 110 beats/min
 - Contraindications: pregnancy, active intravascular clotting
 - Dosing: Initial bolus of 1g over 10 minutes (Slow IV push)
 - Continue resuscitation with repeat 500 mL NS bolus to keep SBP >90

Prolonged transport or in hospital management options

- Monitor for hemorrhagic shock; repeat IV fluid bolus as needed to keep SBP >90
- Consider TXA (10 mg/kg) in non-pregnant patients, use in pregnancy seems more controversial due to prothrombotic effects of pregnancy and TXA

Calculation of estimated date of delivery and gestational age

- Estimated date of delivery = First day of LMP + 1 year + 7 days - 3 months
- Gestational age = Time (in weeks) from the first day of the women's LMP to the current date

References

- Mahadevan SV, Garmel GM (eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY 2012.
- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.
- WOMAN Trial Collaborators. Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial. Lancet. 2017;389(10084):2105–2116.

ABDOMINAL TRAUMA

Definition

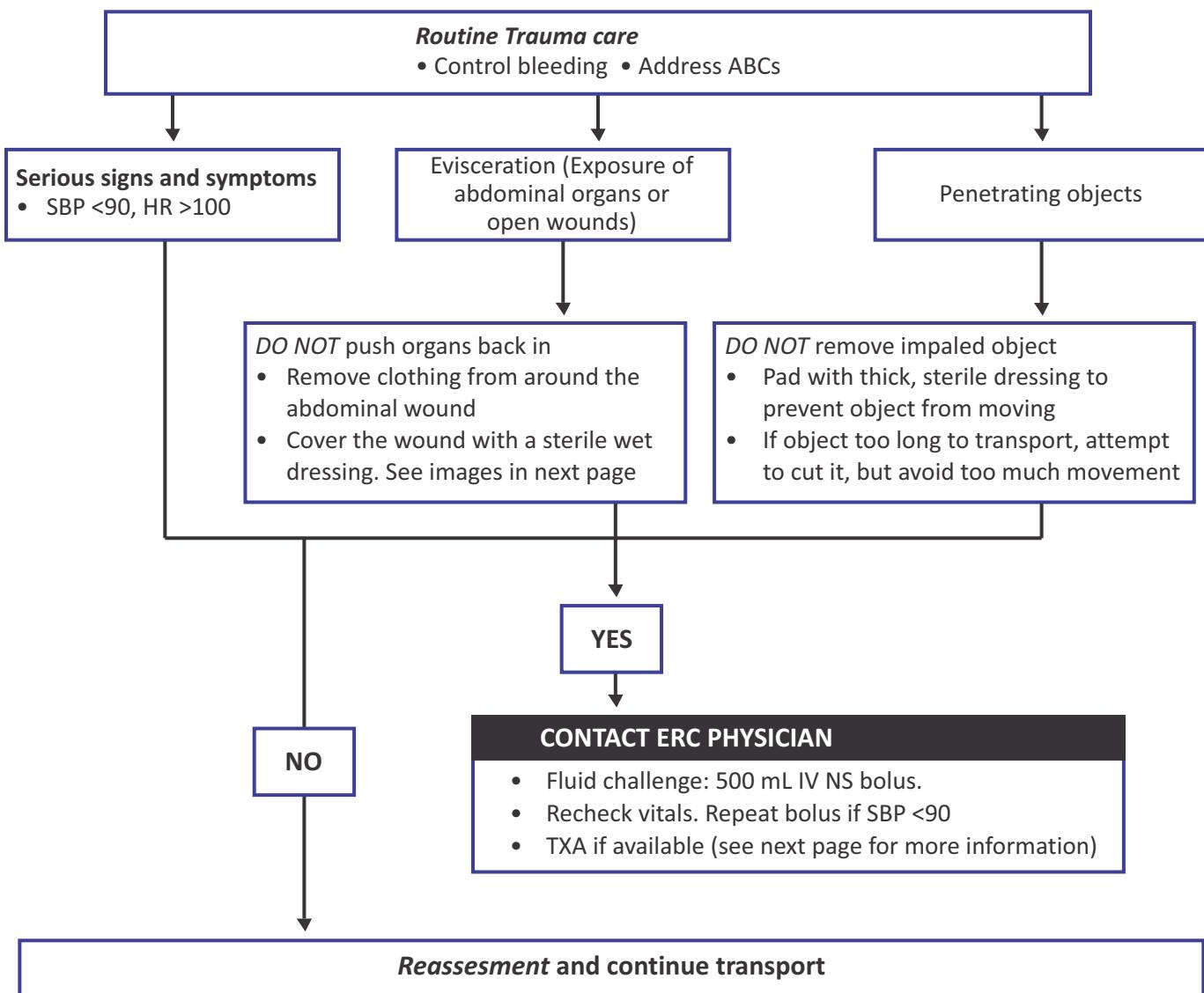
- Damage to abdomen from either blunt or penetrating injury

Key points

- Abdominal injuries can lead to severe blood loss and death
- Patients can have severe injury without abdominal pain
- Assume all patients with penetrating trauma, external signs of trauma, or significant blunt force trauma have internal organ injury

Serious signs and symptoms

- | | | |
|--|-----------------------------|-------------------------|
| • Shock (hypotension, tachycardia) | • Severe abdominal pain | • Distension of abdomen |
| • Penetrating trauma | • Intestines/organs exposed | • Rigid abdomen |
| • Contusion (bruising) of abdomen or flank | • Altered mental status | |



ERC Physician

Key points

- Assume all penetrating injuries or trauma with significant force have internal organ injuries
- Patients with immediate life-threats should be routed to the closest appropriate facility
- Contact receiving hospital to ensure availability of surgeon, operating theater, anesthetist and blood bank

Prehospital management options

- **Pain control**
 - Paracetamol 1000 mg IV/IM
 - Tramadol 25-50 mg IV as needed for severe pain
 - DO NOT give if SBP <90 or RR <12
 - May repeat every 15 min as needed for further pain control (max 100 mg)
- **TXA (Tranexamic Acid) if available**
 - Indications: severe bleeding with systolic blood pressure of <90 or heart rate > 110 beats/min, within 3 hrs of injury
 - Contraindications: pregnancy, active intravascular clotting
 - Dosing: Initial bolus of 1g over 10 minutes (Slow IV push)

Prolonged transport or in hospital management options

- Administer 500 mL IV NS followed by continuous infusion max 1000ml
- Monitor for hemorrhagic shock; repeat fluid bolus as needed to keep SBP >90
- Nothing By Mouth
- Consider repeated dosing of pain medication as needed

Pediatrics

Key points

- **Paracetamol 15 mg/kg IV** to maximum of 1000 mg
- 20 mL/kg IV NS up to 500 mL

Treatment of evisceration



References

- Almuwallad A, Cole E, Ross J, Perkins Z, Davenport R. The impact of prehospital TXA on mortality among bleeding trauma patients: a systematic review and meta-analysis. *J Trauma Acute Care Surg.* 2021;90(5):901–907.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.
- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. *Rosen's Emergency Medicine: Concepts and Clinical Practice*. 10th ed. Elsevier; 2023.

AMPUTATION

Definition

- Partial or total separation of an extremity, finger, toe, or ear from trauma

Key points

- Control bleeding; assess for signs of shock and other sites of trauma
- Recover the separated body part and transport with patient
- Amputated extremities may be successfully reattached if surgery occurs within 6 hours of injury or up to 12 hours if separated body part is placed on ice

Serious signs and symptoms

- | | |
|------------------------------------|----------------------------|
| • Shock (hypotension, tachycardia) | • Multiple sites of trauma |
| • Altered mental status | • Active bleeding |

Routine Trauma care

- Nothing By Mouth

Extremity injury with amputation

No

See appropriate protocol

- **Extremity injury protocol** (Refer Page 98)
- **Crush injury protocol** (Refer Page 94)

Yes

Control bleeding

- **Extremity hemorrhage control protocol** (Refer Page 96)
- Dress open wounds with sterile gauze

SBP <90, HR >100

-OR-

Serious signs and symptoms

No

CONTACT ERC PHYSICIAN

- Locate the amputated body part
- Gently rinse the body part in sterile saline and wrap in sterile gauze (moistened with sterile saline)
- Place in a water-tight container or plastic bag
- Place container on ice or ice pack for cooling
- **DO NOT** place body part in direct contact with ice
- Transport body parts with patient to hospital

CONTACT ERC PHYSICIAN

- Fluid challenge: 500 mL IV NS bolus
- Recheck vitals and repeat bolus if SBP <90

Reassessment and continue transport

ERC Physician

Key points

- Patients with immediate life-threats should be routed to the closest appropriate facility
- Patients with extremity injuries should be transported to a hospital with emergent orthopedic surgery capabilities
- *NEVER* discard amputated body parts (regardless of the severity of injury)
- *DO NOT* directly immerse (soak) amputated body parts in saline (or other liquids) as this may cause severe tissue maceration (softening and breakdown)

Prehospital management options

- Pain control
 - Paracetamol 1000 mg IV/IM
 - Tramadol 25-50 mg IV as needed for severe pain
 - *DO NOT* give if SBP <90 or RR <12
 - May repeat every 15 minutes as needed for further pain control (max 100 mg)

Prolonged transport or in hospital management options

- Administer 500 mL NS followed by continuous infusion
- Monitor for hemorrhagic shock; repeat fluid bolus as needed to keep SBP >90
- Nothing By Mouth
- Consider repeated dosing of pain medication as needed

Pediatrics

Key points

- Paracetamol 15 mg/kg IV/IM to maximum of 1000 mg
- 20 mL/kg IV NS bolus up to 500 mL

Treatment of Amputation



References

- Roberts JR, Custalow CB, Thomsen TW, et al. Roberts and Hedges' Clinical Procedures in Emergency Medicine and Acute Care. 7th ed. Philadelphia, PA: Elsevier; 2018.
- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.

BURNS

Key points

- Carefully evaluate rescuer and scene safety, ask for assistance
- Remove clothing but not material stuck to patient
- Avoid hypothermia
- Assess for trauma
- Always consider inhalation injury with thermal burns

Serious signs and symptoms

- Signs of shock (hypotension, tachycardia)
- Airway/respiratory distress

Signs and symptoms of inhalation injury

- Shortness of breath, singed nose hairs
- Burns around nose and mouth
- Sooty sputum, brassy cough
- Hoarseness of voice

Routine Trauma care

- 2 large bore IVs if possible
- Airway management
- Avoid placing IVs through burned tissue

Signs and symptoms of inhalation injury

Yes

- See *Smoke inhalation protocol* (Refer Page 74)

No

Thermal Burns

- Stop burning
- Cover with saline soaked gauze
- Remove clothing/jewelry

Chemical Burns

- Remove clothing
- Brush off dry powder
- Skin and eye: 30 min water irrigation to exposed area
- Identify chemical

Electrical Burns

- Reverse triage**
- Turn off power
 - See *AED protocol* (Refer Page 7) if unconscious or pulseless

Radiation Burns

- Remove clothing
- Cover with saline soaked gauze

CONTACT ERC PHYSICIAN

- SBP <90, HR >100, **Serious signs and symptoms** -OR- transport time >30 minutes

Yes

- Fluid resuscitation: 500 mL IV NS bolus; repeat as necessary

No

Wound management

- Elevate burned extremities
- Do not break blisters
- Do not apply ice directly to skin
- Dress wounds with dry, sterile gauze
- Place clean sheet over and under patient (decreases heat loss)

- **Pain control** (see box in next page)
- **Reassessment and continue transport**

ERC Physician

Key points

- Grading burn severity: refer to ABA classification (table below)
- Patients with moderate or major burns should be transported to a burn center if no immediate life threats (primarily airway/other trauma)
- Patients with immediate life threats should be routed to the closest appropriate facility
- Contact appropriate authorities/hospitals as necessary for fire/chemical/radiation/electrical hazards
- Prolonged cooling of TBSA >9% can cause hypothermia
- For electric burns, use **reverse triage** (pulseless, apneic patients are treated first)
- Patients with larger burns (>40% TBSA) should be intubated early.

Prehospital management options

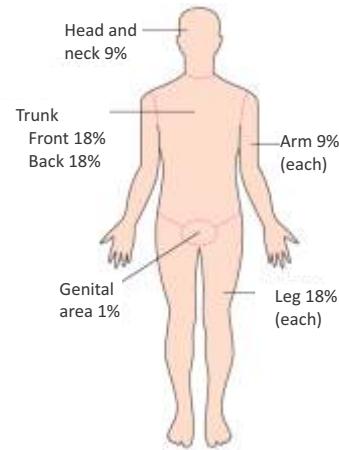
- Pain control**
 - Paracetamol 1000 mg IV/IM**
 - Tramadol 25-50 mg IV** as needed for severe pain; *DO NOT* give if SBP <90 or RR <12
 - May repeat every 15 min as needed for further pain control (max 100 mg)
- Administer IV NS per hospital formula (Parkland) if prolonged transport
- If transport is delayed, consider immersing smaller burns (%TBSA <9%) in cold water for 30 minutes

Pediatrics

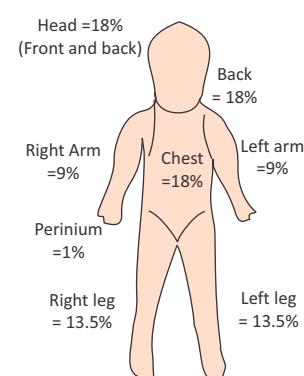
Key points

- Different % for Rule of 9's (**see Figure**)
- Larger TBSA relative to weight, so greater fluid requirement

- % TBSA (Total Burn Surface Area)** = % Full thickness + % Partial thickness (not superficial)
- Superficial: Affects only skin surface (epidermis). Skin is red and painful without blisters.
- Partial thickness: Deeper burns involving epidermis and dermis. Skin is painful with blisters. Deep partial-thickness burns can be painful or painless and may blister.
- Full thickness: All skin layers damaged. Skin is white, brown or black.
- Parkland formula**:
 - 2 ml of lactated Ringer's x patient's body weight in kg x % TBSA for partial thickness and full thickness burns.



Minor burn	Moderate burn	Major burn
<10% TBSA in adult <5% TBSA in young (<10 years) or old (>50 years) <2% full-thickness burn	10-20% TBSA in adult 5-10% TBSA in young or old 2-5% full-thickness burn High-voltage injury Suspected inhalation injury Circumferential burn Concomitant medical problem predisposing to infection (e.g., diabetes, sickle cell disease)	>20% TBSA in adult >10% TBSA in young or old >5% full-thickness burn High-voltage burn Known inhalation injury Any significant burn to face, eyes, ears, genitalia, hands, feet, or major joints Significant associated injuries (e.g., major trauma)



References

- Mahadevan SV, Garmel GM(eds). An Introduction to Clinical Emergency Medicine, 2nd ed. Cambridge University Press, New York, NY 2012.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.

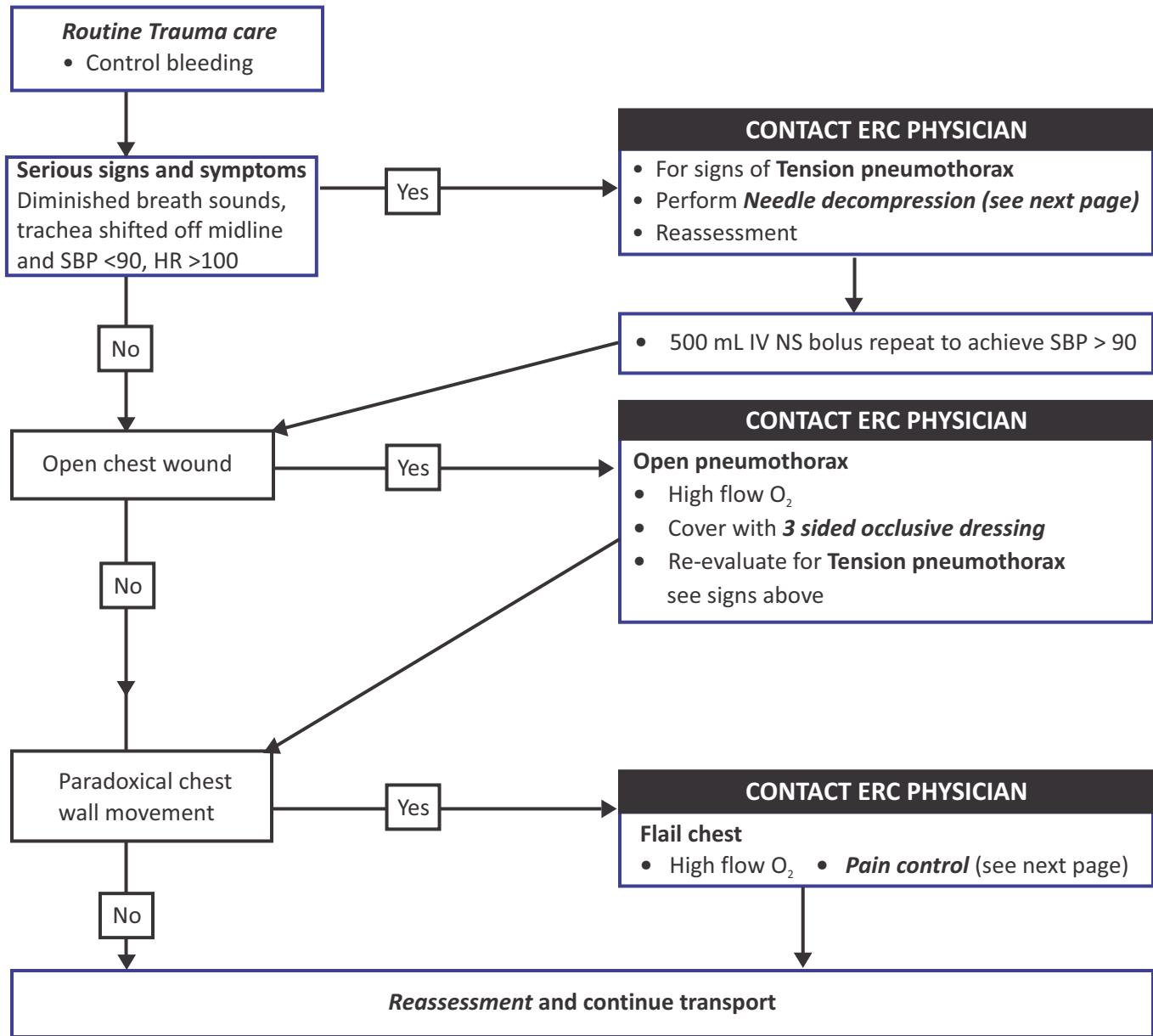
CHEST TRAUMA

Key points

- Consider mechanism of injury (penetrating vs. blunt)
- Severe intra-thoracic injury can occur without external signs of trauma
- Consider associated spine injury
- Stabilize any impaled objects; *DO NOT* remove impaled objects

Serious signs and symptoms

- | | | |
|---------------------------|---------------|---------------------------|
| • Chest pain | • Hypotension | • Decreased breath sounds |
| • Shortness of breath | • Tachycardia | • Tracheal deviation |
| • JVD | • Tachypnea | |
| • Paradoxical wall motion | • Crepitus | |



ERC Physician

Key points

- If possible, transport the patient to a trauma hospital
- Patients with immediate life-threats (tension pneumothorax, massive hemothorax, flail chest, open pneumothorax, pericardial tamponade, traumatic aortic injury) should be routed to the closest appropriate trauma facility

Prehospital management options

- Support blood pressure with IV fluids
- *DO NOT* use strapping, bulky dressings or ace bandaging for chest injuries
- **Pain control**
 - Paracetamol 1000 mg IV/IM
 - Tramadol 25-50 mg IV as needed for severe pain
 - *DO NOT* give if SBP <90 or RR <12
 - May repeat every 15 min as needed for further pain control (max 100 mg)

Prolonged transport or in hospital management options

- Administer 500 mL IV NS followed by continuous infusion (monitor for hemorrhagic shock; repeat fluid bolus as needed to keep SBP >90) Max 1000 mL IV NS
- Consider repeated dosing of pain medication as needed
- Consider early intubation and positive pressure ventilation for flail chest/underlying pulmonary contusion

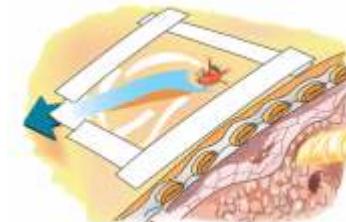
Needle decompression of tension pneumothorax

- Rapid insertion of 14-16 gauge catheter needle into 4th/5th intercostal space in anterior to mid-axillary line (release of intrapleural air)
- Needle is removed leaving the catheter in chest
- Repeat procedure for recurrence of tension pneumothorax



3-sided occlusive dressing of open pneumothorax

- Use sterile, occlusive dressing leaving one corner untaped to produce a flutter-type valve (**see Figure**)
- May use plastic wrap or petroleum gauze for dressing
- During inspiration, the dressing prevents air entry
- During expiration, air can escape
- If an open pneumothorax progresses to a tension pneumothorax, remove the occlusive dressing



Dressing allows trapped air to escape through the untaped section of dressing on expiration

References

- Mejia A, Elling B, Aehlert B, eds. Nancy Caroline's Emergency Care in the Streets. 9th ed. Jones & Bartlett Learning; 2022.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.

CRUSH INJURIES

Definition

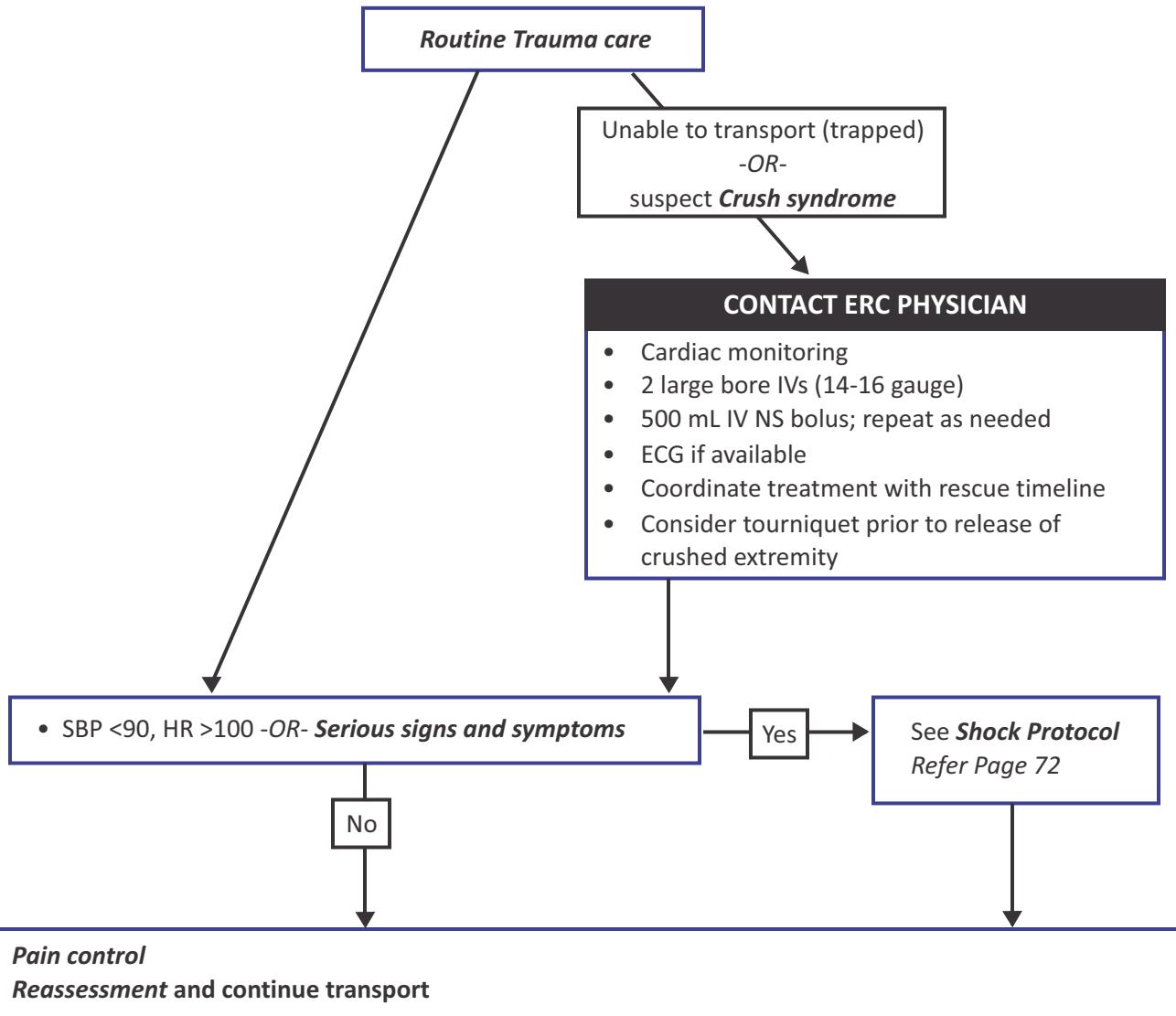
- **Crush injury:** Damage to a body part when crushed between two objects
- **Crush syndrome:** Systemic problems caused by a crush injury due to muscle breakdown (rhabdomyolysis)
 - Usually takes 4-6 hours to develop; can occur in 1 hour in high pressure setting
 - Usually occurs in lower extremities, buttocks
 - The more extremities with crush injury, the more likely to have crush syndrome

Key points

- Evaluate rescuer and scene safety; call for assistance if the patient is trapped
- External signs of injury may not indicate the severity of internal injury and organ damage
- Early aggressive IV fluid therapy can prevent kidney failure - Start this before extrication
- If prolonged entrapment, prepare for cardiac arrest when patient released

Serious signs and symptoms

- Shock (hypotension, tachycardia, tachypnea)
- Cardiac dysrhythmias



ERC Physician

Key points

- Destination hospital
 - Patients with severe crush injuries should be transported to a trauma hospital
 - Patients with immediate life threats should be routed to the closest appropriate facility
- **Crush syndrome**
 - Continual cardiac monitoring and ECG (if available) important
 - Treatment with IV fluids and management of hyperkalemia are essential

Pre-hospital management options

- Consider 2 LIV NS, followed by continuous NS infusion
- Keep patient NBM (Nothing By Mouth)
- **Pain control**
 - **Paracetamol 1000 mg IV/IM**
 - **Tramadol 25-50 mg IV** as needed for severe pain
 - *DO NOT* give if SBP <90 or RR <12
 - May repeat every 15 min as needed for further pain control (max 100 mg)

Prolonged transport or in hospital management options

- **Fluid support**
 - For prolonged extrication: 1L/hour x 2 hours then 500mL/hour
 - For prolonged transport: continue 1L/hour
 - Adjust for urine output 200-300 ml/hour
- **Hyperkalemia**
 - Hyperkalemia (peaked T waves, absent P waves, widened QRS)
 - Calcium chloride 1 gram (10 ml) slow IV/IO push over 3-5 minutes
 - Sodium bicarbonate 50mEq (50 ml) slow IV/IO push over 1 minute
 - Salbutamol neb 10 mg
 - Cardiac dysrhythmias (mostly due to hyperkalemia)
- **Calcium Gluconate 1 gram (10 ml of 10% Solution) slow IV/IO push over 3-5 minutes with cardiac monitoring**

Pediatrics

Key points

- Managed similarly to adults
- 20 ml/kg/hour x 2 hours, then 10 ml/kg/hour for prolonged extrication.
- Adjust for urine output 4 mL/kg/hour
- Pain control
- **Paracetamol 15 mg/kg IV** to max of 1000 mg

References

- Mejia A, Elling B, Aehlert B, eds. Nancy Caroline's Emergency Care in the Streets. 9th ed. Jones & Bartlett Learning; 2022.
- Sever MS, Vanholder R. Crush-related acute kidney injury. In: Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. Published 2023.
- Haines LN, Doucet JJ. Severe crush injury in adults. In: Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc. Published 2021.

EXTREMITY HEMORRHAGE CONTROL

Four methods to stop external bleeding: (1) direct pressure, (2) elevation, (3) pressure dressing and (4) tourniquets. Use methods in this order.

1. DIRECT PRESSURE

- Place sterile gauze (or gloved hand) over the wound and apply firm pressure until bleeding stops
Apply pressure to smallest area possible
- Secure dressing in place with a bandage

2. ELEVATION: DO NOT use in extremities with suspected fractures/dislocations -OR- with possible spinal injury

- Raise the injured extremity, above the level of the heart if possible
- Maintain direct pressure over the site of bleeding

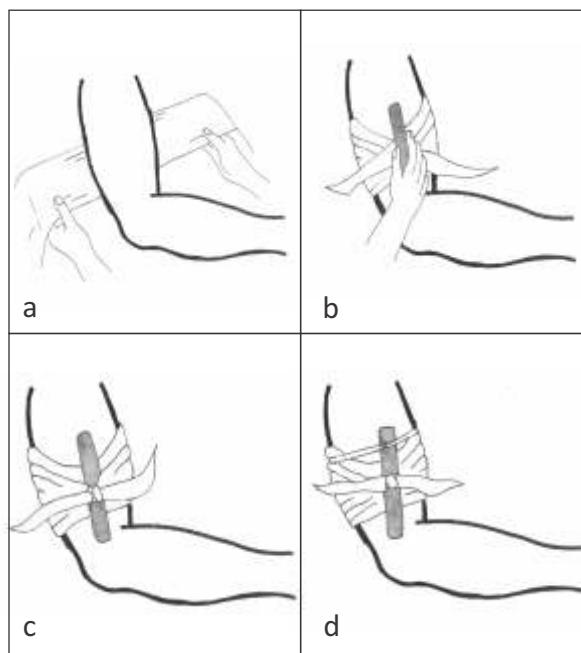
3. PRESSURE DRESSING : Apply pressure dressing over the injury (see **Figure below**)

4. TOURNIQUET: Use when direct pressure, elevation have failed

Have low threshold to apply tourniquet. Note time applied

Contact ERC physician before placement (see **Figure below**)

- Identify a location 4 cm above the wound (between the wound and the patient's heart)
- Place tourniquet material (gauze/cloth) around the patient's limb and tie a knot
- Place a rigid object (stick or metal rod) over the knot and secure it with a second knot
- Rotate the stick to tighten the tourniquet until the bleeding has stopped. Do not tighten beyond this point. Secure in place. Document the time the tourniquet was applied. If prolonged transport (>30 min), consider loosening the tourniquet (see **algorithm next page**).
- You may use a blood pressure cuff as a temporary tourniquet. Place cuff on extremity proximal to injury, and inflate until bleeding stops.

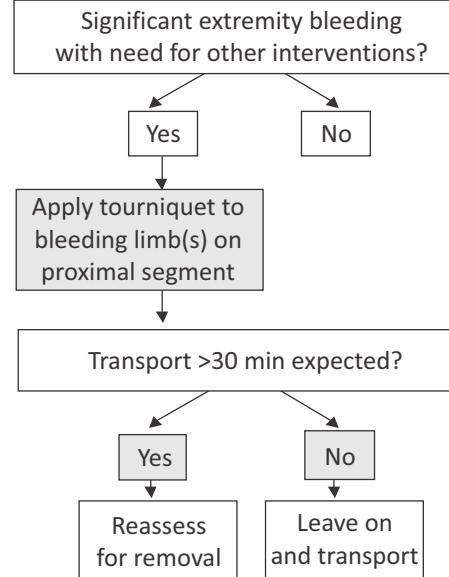


Tourniquet Placement

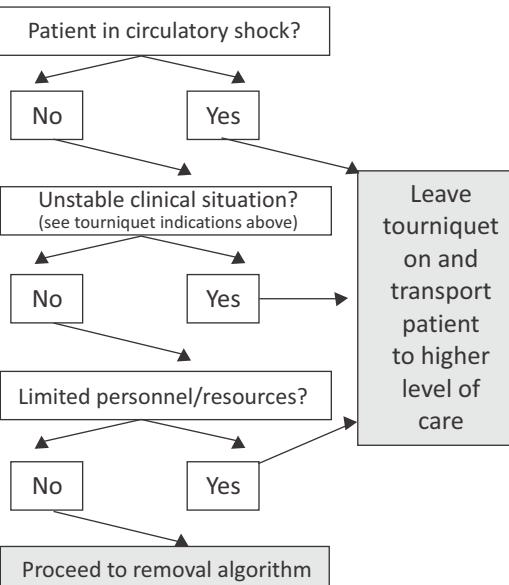
Tourniquet indications

- Failure to stop bleeding with pressure dressing(s)
- Injury does not allow control of bleeding with pressure dressing(s)
- Significant extremity hemorrhage in the face of any or all of:
 - Need for airway management
 - Need for breathing support
 - Circulatory shock
 - Need for other emergent interventions or assessment
- Bleeding from multiple locations
- Impaled foreign body with ongoing extremity bleeding
- Under fire or other dangerous situation for responding caregivers
- Total darkness or other adverse environmental factors
- Mass casualty event

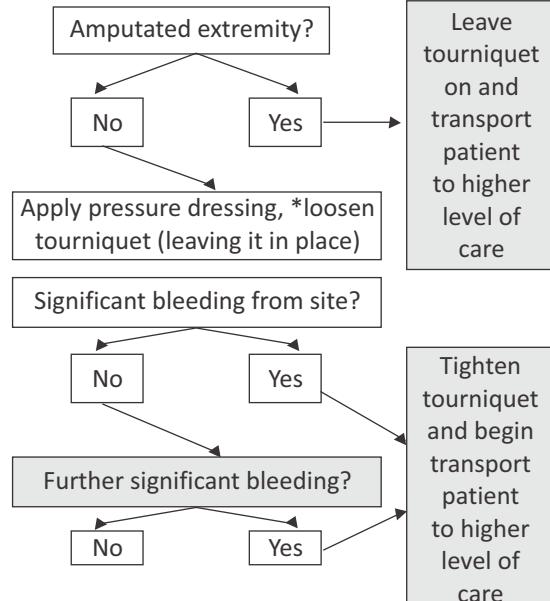
Routine tourniquet use algorithm



Tourniquet reassessment algorithm



Tourniquet removal algorithm



References

- Doyle GS, Taillac PP. Tourniquets: A Review Of Current Use With Proposals For Expanded Prehospital Use. *Prehospital Emerg Care.* 2008;12:241-256.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.

EXTREMITY INJURY

Definition

- Damage to an extremity from blunt or penetrating injury

Key points

- Control bleeding
- Avoid using the injured extremity for IV placement
- Exam should include pulse, motor and sensation in the affected extremity
- Determine if injury is closed or open (skin has been punctured or lacerated)

Serious signs and symptoms

- | | | |
|---|------------------|----------------------------|
| • Shock (hypotension, tachycardia) | • Open fracture | • Cold/pulseless extremity |
| • Paralysis, motor deficits, sensory deficits | • Deformity | • Active bleeding |
| • Pallor | • Rapid swelling | |

Routine Trauma care

- Control bleeding
- See Extremity hemorrhage protocol (Refer page 96)

Crush injury or amputation

Yes

- See Amputation protocol (Refer page 88)
- See Crush injury protocol (Refer page 94)

No

- Dress open wounds with sterile gauze
- Do not push exposed bones under the skin

SBP <90, HR >100

-OR-

Serious signs and symptoms

Yes

CONTACT ERC PHYSICIAN

- Fluid challenge: 500 mL NS IV bolus
- Recheck vitals.
- Repeat bolus if SBP <90

No

- **Assessment of neurovascular function**
- If extremity is pulseless, attempt gentle in-line traction to restore normal anatomic position
- May require pain medication prior
- If repositioning does not restore circulation, do not manipulate further

- Consider Limb realignment for suspected angulated fractures
- Immobilize extremity with splint
- Repeat Assessment of neurovascular function

Reassessment and continue transport

ERC Physician

Pre-hospital management options

- Patients with immediate life-threats should be routed to the closest appropriate facility
- Patients with extremity injuries should be transported to a hospital with emergent orthopedic surgery capabilities
 - Blood flow must be restored within 6 hours of injury to save a pulseless extremity
 - Open (compound) fractures will require antibiotics within 6 hours of injury
- **Pain control**
 - **Paracetamol 1000 mg IV/IM**
 - **Tramadol 25-50 mg IV** as needed for severe pain
 - DO NOT give if SBP <90 or RR <12
 - May repeat every 15 min as needed for further pain control (max 100 mg)

Prolonged transport and in hospital management options

- Continue frequent assessment of neurovascular function
- Administer 500 mL IV NS bolus followed by continuous infusion
- Monitor for hemorrhagic shock; repeat fluid bolus as needed to keep SBP >90
- Nothing By Mouth
- Consider repeated dosing of pain medication as needed

Assessment of neurovascular function

- Check pulse
- Check capillary refill, skin temperature and color
- Check sensation
- Check motor (wiggle fingers/toes)

Limb realignment

- Proximal limb remains in position
- Distal limb is aligned with gentle axial traction
- Place in position of function (half-way between flexion and extension)

Immobilize extremity with splint

- Remove or cut away clothing before splinting
- Pad the splint well
- Wrap any splinting device or bandage from distal to proximal
- Finger test: Make sure you can easily push a finger beneath the wrapping
- If possible, do not cover fingers and toes (to allow serial neurovascular assessments)

Pediatrics

Key points

- **Paracetamol 15 mg/kg IV** to maximum of 1000 mg
- 20 mL/kg IV NS bolus up to 500 mL

References

- Mejia A, Elling B, Aehlert B, eds. Nancy Caroline's Emergency Care in the Streets. 9th ed. Jones & Bartlett Learning; 2022.
- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.

HEAD INJURY

Key points

- Prevent secondary brain injury by preventing hypoxia and hypotension
- Always assess for associated spinal injuries
- Avoid using an NPA if facial trauma is present (especially with signs of basilar skull fracture)
- *Cushing's reflex* (↑ BP, bradycardia and apnea) is concerning for severe head injury

Serious signs and symptoms

- | | | |
|-------------------------|----------------------------|-------------------------------|
| • Altered mental status | • Severe hypertension | • CSF leak, ear/nose bleeding |
| • Neurological deficits | • Unilateral dilated pupil | • Bradycardia |
| • Seizures | • Vomiting | |

Routine Trauma care

- Use spinal immobilization

- Assess consciousness (**AVPU** and/or **GCS**)
- Assess pupils
- Assess gross motor movements

A Awake and aware

V Responds to verbal stimuli

P Responds to painful stimuli

(Typical maneuvers include forcefully grinding the knuckles of one's fist into the sternum or squeezing two toes together while a firm object is wedged between them)

U Unresponsive

Abnormal consciousness, unprotected airway, inadequate breathing -OR- **Serious signs and symptoms**

No

Manage circulation

- Control scalp bleeding - Direct pressure when possible
- IV fluids to maintain SBP >90

Yes

Manage airway and breathing

- See **Airway management protocol** (Refer page 05)
- Maintain $\text{SpO}_2 \geq 94\%$

CONTACT ERC PHYSICIAN

Wound management

- Stabilize impaled objects with a bulky dressing (only remove objects if obstructing airway)
- Neck wounds
 - Place occlusive dressing; apply pressure
 - *DO NOT* apply circumferential wrapped neck bandages
- Eye injury: Cover injured eye; avoid direct contact or pressure on the globe
- Teeth avulsion: Keep avulsed teeth in saline soaked gauze (and transport with patient)

- If altered mental status, check GRBS

Reassessment and continue transport

ERC Physician

Key points

- Agitation is not uncommon and can exacerbate head injuries. Treat as per behavioral protocol (*Refer page 22*)
- Patients with immediate life-threats should be routed to the closest appropriate facility
- Patients with head injuries should be transported to a hospital with emergent neurosurgical capabilities
- Goals are to prevent hypoxia, hypotension and hypoglycemia
- Posttraumatic seizures are common
- If a head injured patient is hypotensive, consider other causes of shock

Pre-hospital management options

- Patients with depressed levels of consciousness and inability to maintain a patent airway require airway management
- For signs of herniation (Cushing's reflex, posturing, unequal pupils), consider brief hyperventilation (target SpCO₂ 35-45)
- Agitation is not uncommon and can exacerbate head injuries. Treat with midazolam 2mg IV or 5mg IM as per behavioral health protocol.

GLASGOW COMA SCALE (GCS)

	Eye opening	
Spontaneous	4	
To Voice	3	
To Pain	2	
None	1	
	Verbal response	
Oriented	5	
Confused	4	
Inappropriate Words	3	
Incomprehensible Sounds	2	
None	1	
	Motor response	
Obeys Commands	6	
Localizes to Pain	5	
Withdraws to Pain	4	
Abnormal Flexion	3	
Abnormal Extension	2	
None	1	
Glasgow Coma Scale Total	15	

Pediatrics

Key points

- Use modified GCS for preverbal children (see **Figure**)
- Hypovolemic hypotension can occur because of head trauma in young children
- Children <2 years old are often difficult to assess and have subtle clinical findings
- Prehospital endotracheal intubation is associated with poorer prognosis in children and if at all possible, should be avoided in this population"

GLASGOW COMA SCALE (GCS)

	Eye opening	
Spontaneous	4	
To Voice	3	
To Pain	2	
None	1	
	Verbal response	
Coos, babbles	5	
Cries, consolable	4	
Persistently irritable (cries)	3	
Restless, agitated (moans)	2	
None	1	
	Motor response	
Spontaneous	6	
Withdraws to Voice	5	
Withdraws to Pain	4	
Abnormal Flexion	3	
Abnormal Extension	2	
None	1	
Glasgow Coma Scale Total	15	

References

- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.

HELMET REMOVAL

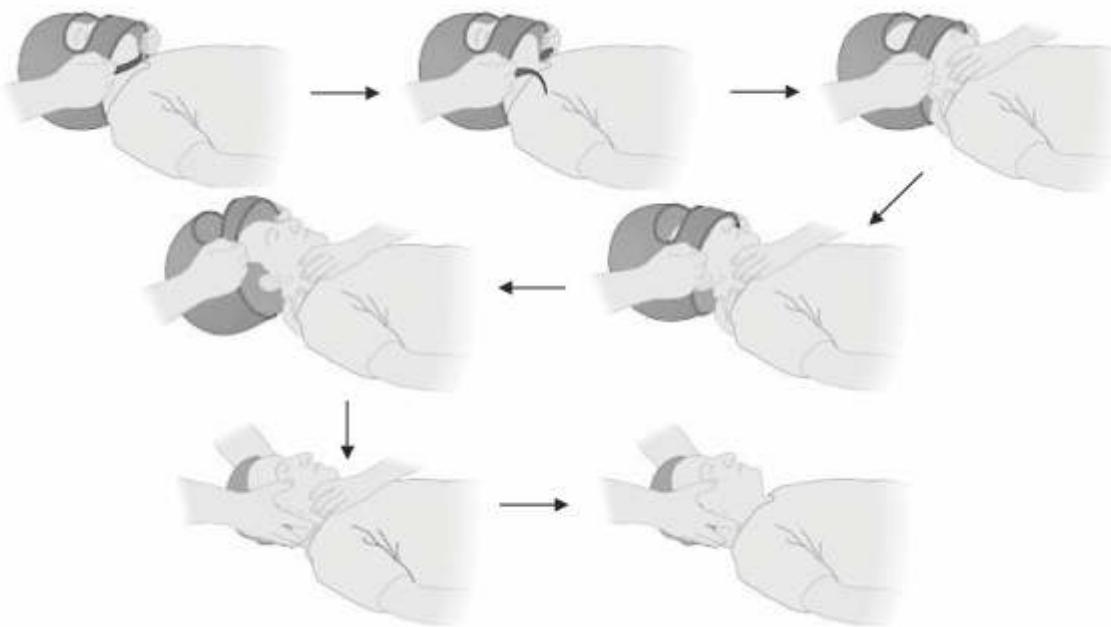
Reasons to remove the helmet in the prehospital setting

- Helmet does not immobilize the patient's head within it
- Cannot securely immobilize the helmet to the long spine board
- Helmet prevents airway care
- Helmet prevents assessment of anticipated injuries
- Present or anticipated airway or breathing problems
- Removal will not cause further injury

Motorcycle helmet removal

- Safe and proper removal of the helmet can *ONLY* be done by two rescuers (manual cervical spine immobilization *MUST* be maintained throughout removal of the helmet)

 1. Open the face shield, if there is one, and assess the patient's airway and breathing. Remove eyeglasses/sunglasses, if applicable.
 2. Rescuer #1: Place hands on either side of the helmet with fingers on the lower jaw to prevent head movement.
 3. Rescuer #2: Loosen the strap and place one hand at the angle of the lower jaw and the other at the occiput.
 4. Rescuer #1: Gently slip the helmet about halfway off, and then stop.
 5. Rescuer #2: Slide hands from the occiput to the back of the head to prevent it from snapping back. Continue removing the helmet (gently rock to clear occiput) and immobilize as usual.
 - All actions should be slow and deliberate



References

- Tintinalli JE, Ma OJ, Yealy DM, Meckler GD, Stapczynski JS, Cline DM, Thomas SH, eds. *Tintinalli's Emergency Medicine: A Comprehensive Study Guide*. 9th ed. New York, NY: McGraw-Hill Education; 2019.

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PELVIC TRAUMA

Definition

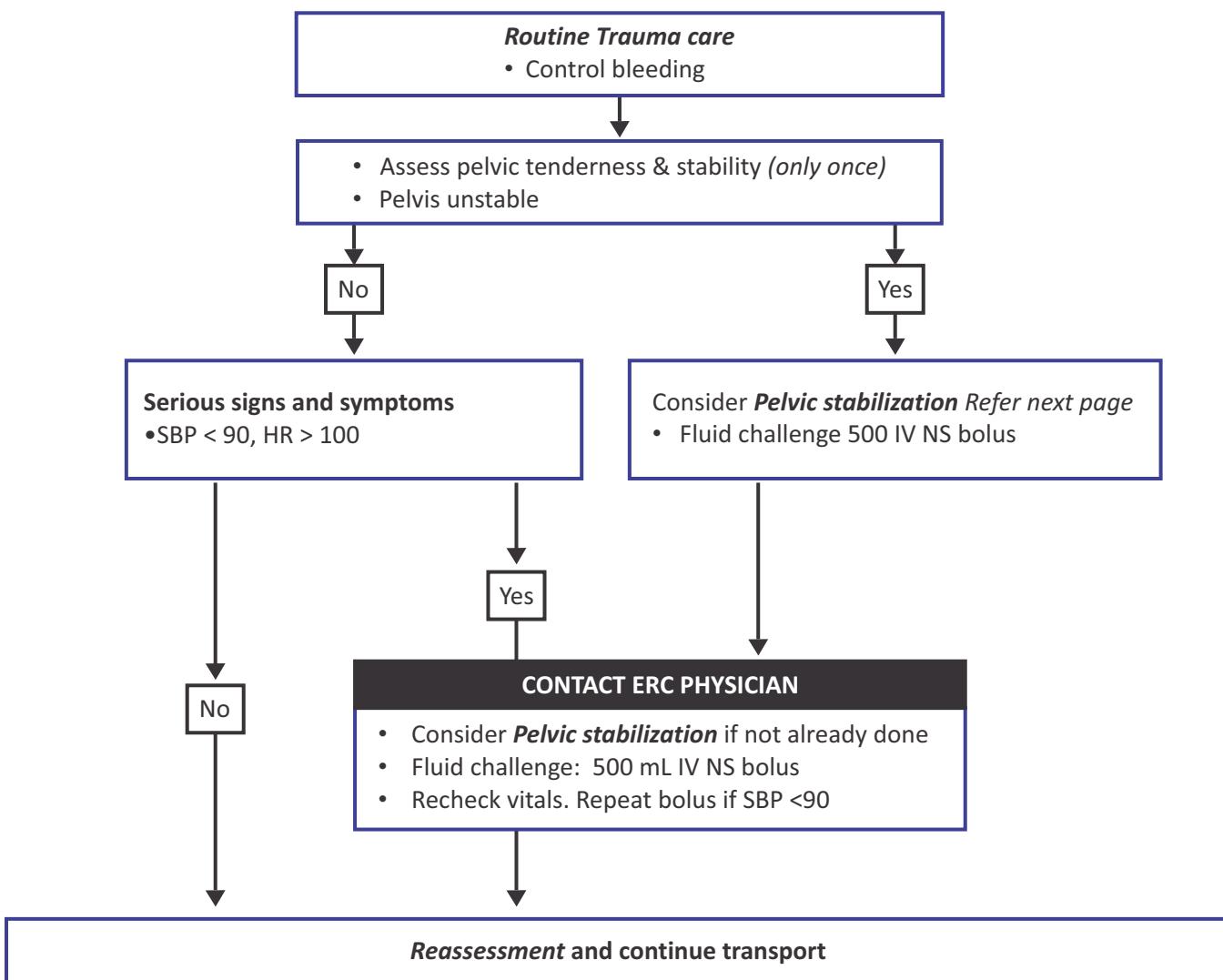
- Damage to the pelvis from blunt or penetrating injury

Key points

- Pelvic injuries can lead to rapid severe blood loss (4-6 L) and death
- Falls, motor vehicle accidents, stabbing, gunshot wounds, work accidents, physical attacks, sexual assaults
- Examine the Pelvic bone by palpating and gently compressing the lateral pelvic rims lateral to medial then anterior to posterior and symphysis pubis for tenderness
 - *ONLY* assess pelvic stability *ONCE* to minimize pelvic movement
- Pelvic stabilization can reduce unstable pelvic fractures, prevent ongoing blood loss and provide pain relief

Serious signs and symptoms

- | | |
|--|---|
| <ul style="list-style-type: none"> • SBP < 90, HR > 100 • Leg numbness and tingling • Low abdomen pain, low back pain, hip or pelvic pain | <ul style="list-style-type: none"> • Pelvic tenderness, crepitus or instability • Asymmetric leg length • Bruising, swelling or open wounds • Visible bleeding with compression without moving pelvis |
|--|---|



ERC Physician

Key points

- Pelvic trauma is life threatening
- Patients with suspected pelvic injuries should go to a hospital with emergent trauma or orthopedic surgery capabilities

Prehospital management options

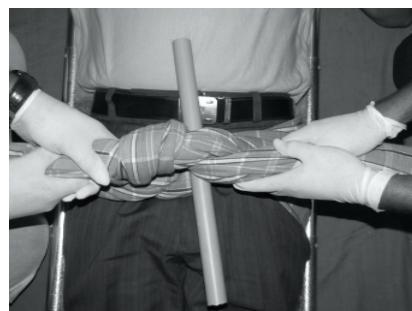
- Pain control**
 - Paracetamol 1000 mg IV/IM**
 - Tramadol 25-50 mg IV** as needed for severe pain
 - DO NOT give if SBP <90 or RR <12*
 - May repeat every 15 min as needed for further pain control (max 100 mg)

Prolonged transport or in hospital management options

- Administer 500 mL IV NS followed by continuous infusion at 125 ml per hr
 - Monitor for hemorrhagic shock repeat fluid bolus upto 2000ml as needed to keep SBP >90

Pelvic stabilization

- Fold the sheet smoothly (do not roll the sheet)
- Place the sheet under the patient's pelvis so it is centered over the greater trochanters (where the head of the femur attaches to the pelvis)
- Tie a knot with the two running ends of the sheet around the patient's pelvis
- Place a rigid object (unbending stick or metal rod) over the knot and secure it with a second knot
- Rotate the stick to tighten the sheet until pelvis is firmly bound
- Once tightened, tie both of the stick to maintain tension



Pediatrics

Key points

- Bones are still forming on young children- do very gentle pelvic bone exam on children < 2 years old
- Paracetamol 15 mg/kg IV** to maximum of 1000 mg
- Tender pelvis, unstable pelvis, hypotension, or tachycardia: 20mL/kg IV NS bolus up to 1000 mL

References

- Walls RM, Hockberger RS, Gausche-Hill M, Erickson TB, Wilcox SR, eds. Rosen's Emergency Medicine: Concepts and Clinical Practice. 10th ed. Elsevier; 2023.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.

SPINAL IMMobilIZATION

Key points

Spinal immobilization indications

- Blunt Trauma
- Altered Mental Status
- Midline spinal pain or tenderness
- Neurologic complaints or findings
- Anatomic deformity of spine

High energy mechanism and any of the following

- Drug or alcohol intoxication
- Inability to communicate
- Distracting Injury

Spinal Immobilization can be deferred if ALL the following Criteria are met

- Normal level of consciousness (GSC 15)
- No spine TTP or anatomic abnormality
- No neurological findings or complaints
- No distracting injuries
- No intoxication

Relative Contraindications:

- Patients with penetrating trauma to the head, neck or torso with no evidence of spinal injury

Manual cervical stabilization

- *Access from behind:* Heel of hand on mastoid, digits on mandible
- *Access from the front:* Heel of hand on mandible, digits on mastoid
- *Access from the side:* One hand on occiput, one under mandible
- *Supine:* Thumbs on clavicles, palms below shoulders
- *Patient found prone/on the side:* Position your hands comfortably



1. Provide **manual cervical stabilization**
2. Move the patient to the neutral, in-line position unless contraindications exist (see below)
3. Maintain that position with manual immobilization
4. Apply the cervical collar
5. Maintain the neutral, in-line position while moving the patient to the long spine board by one of the following techniques
 - a. Log Roll Include pictures
 - b. 90 Degree
 - c. 180 Degree
 - d. Straddle Slide
 - e. Rapid extrication procedure
6. Secure the patient to the board (long spine board immobilization)

Neutral, in-line position

- a. Supine; Nose, navel and toes aligned
- b. Head elevated 3-5 cm off the ground
- c. Hips and knees slightly flexed-place a rolled blanket under the knees

Contraindications to the neutral, in-line position

- Movement causes an increase in pain
- Meeting resistance during the procedure
- Increased neurologic signs or deficits with head movement
- When the spine is grossly deformed



Moving the patient to a long spine board

- Use the technique that causes the least spinal movement
- Coordinate the move
- Move the body as a unit
- Most patients are best served with supine positioning
- *NO* lateral pushing: Move patient up and down to prevent lateral bending
- Rescuer at the head "CALLS" all moves
- All moves must be slowly executed and well coordinated
- Consider the final positioning of the patient prior to beginning move

Long spine board immobilization

- Strap to prevent AP and lateral movement
 - Strapping should allow rotation (90 degrees) to clear vomitus
 - Strap across shoulder and pelvis, not across central abdomen
- Tie legs together
- Blanket under the knees
- Apply cervical immobilization device

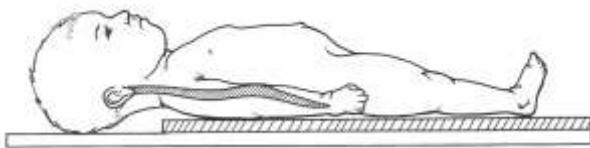
Cervical collar application

- Size and apply according to the manufacturer's recommendation
 - Collar should fit snugly
 - Collar *SHOULD NOT* impede respiration or jaw movement
 - Head should continue to be in neutral position
- *DO NOT* release manual control until the patient is fully secured in a spinal immobilization device

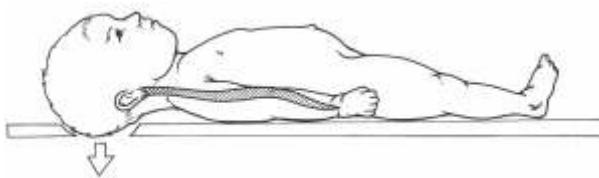
Pediatrics

Key points

- Backboards with an occipital recess or double mattress pad under the body – raise the chest and lift the neck out of flexion



Double Mattress Pad



Occipital Recess

References

- American College of Surgeons Committee on Trauma; American College of Emergency Physicians; National Association of EMS Physicians. Spinal motion restriction in the trauma patient: a joint position statement. Prehosp Emerg Care. 2018;22(6):673–678.

SPINAL TRAUMA

Definitions

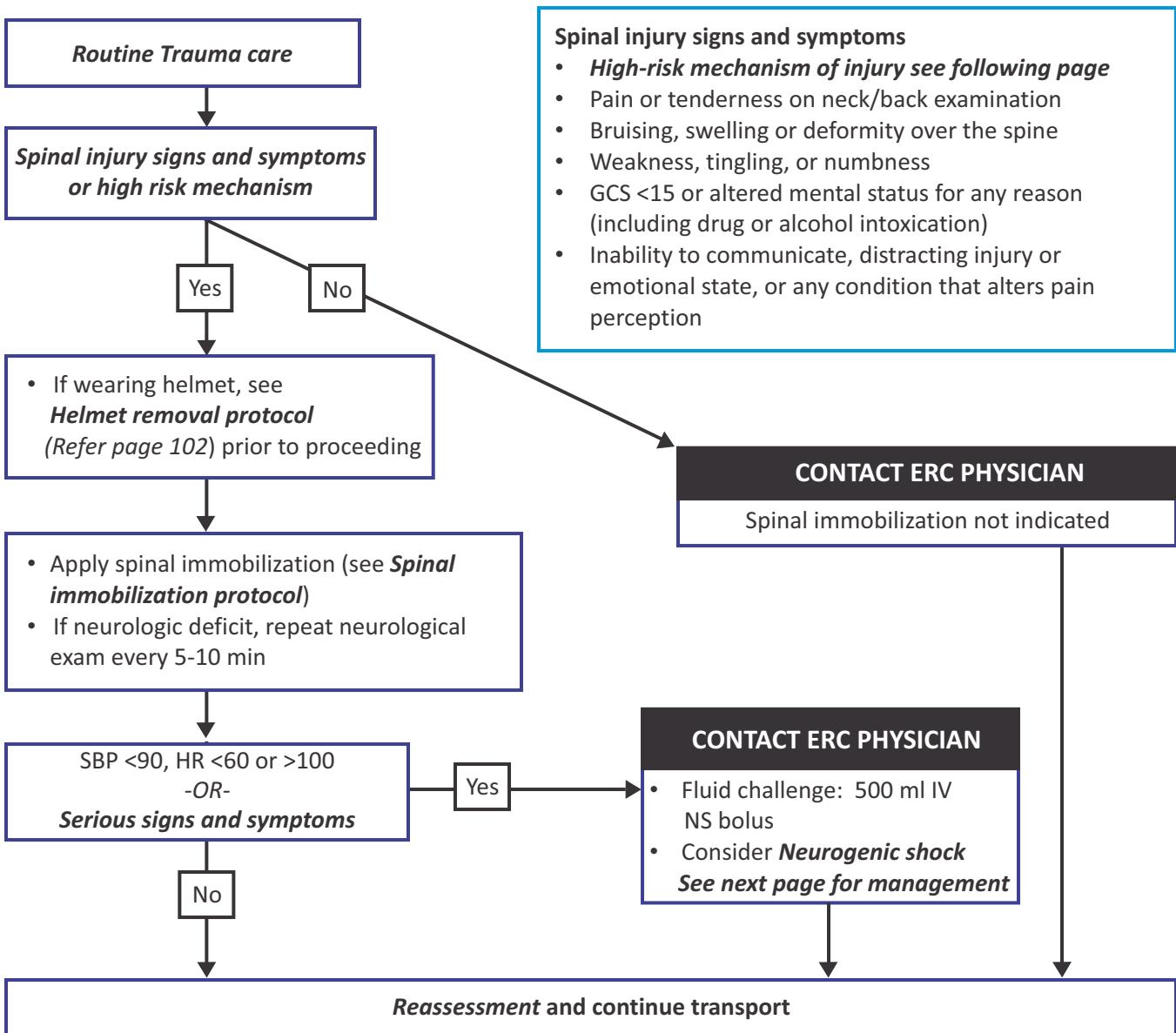
- Injury from blunt or penetrating trauma to the cervical, thoracic or lumbar spine that threatens the spinal cord

Key points

- Proper immobilization can minimize further spinal cord injury during transport
- Proper immobilization involves semi-rigid collar, head immobilization, backboard, tape and straps
- Suspect spinal cord injury in a high risk mechanisms of injury (see following page)
- If there is ANY concern for spinal injury, immobilize prior to assessment and defer exam
- Once a patient is in spinal immobilization, avoid removing in the prehospital setting

Serious signs and symptoms

- | | | |
|---------------|-------------------------|---------------------------------------|
| • Hypotension | • Bradycardia | • Neurologic deficits (motor/sensory) |
| • Deformity | • Altered mental status | |



ECR Physician

Prehospital management options

- **Neurogenic shock:** Hypotension, bradycardia, and peripheral vasodilation
 - Hemodynamically unstable bradycardia ($HR < 50$ with $SBP < 90$ or end organ deficits such as dizzy, cool hands, cap refill > 3 seconds)
 - Consider **Atropine 1 mg IV**
 - Hypotension unresponsive to fluid bolus:
 - Consider one of the following vasopressors in addition to IVF. If $SBP < 90$, titrate to $SBP 90-110$.
 - Dopamine 5-20 mcg/kg/min IV
 - Noradrenaline 1-30 mcg/min IV
 - Adrenaline 2-10 mcg/min IV
 - $SBP < 80$ mmHg in the setting of trauma is rarely due to spinal cord injury alone, and other causes of shock, primarily from hemorrhage, must be excluded
- **Pain control**
 - **Paracetamol 1000 mg IV/IM**
 - **Tramadol 25-50 mg IV** as needed for severe pain
 - *DO NOT* give if $SBP < 90$ or $RR < 12$
 - May repeat every 15 min as needed for further pain control (max 100 mg)

High risk mechanism of injury

- Any high velocity blunt trauma
- Significant RTA (especially rollover, ejection, unrestrained occupant, death of occupant)
- Vehicular damage with passenger space intrusion of 0.3 meters or more
- Ejection from moving vehicle
- Diving injury
- Motorcycle or Rickshaw crash with separation of rider from vehicle
- Falls (especially fall $> 3x$ the patient's height)
- Direct spinal trauma
- Penetrating trauma (e.g., GSW) near spine
- Head or facial trauma

Other risk factors for spinal injury

- Age > 65 (especially with relatively minor trauma)
- Pre-existing spinal conditions (e.g., ankylosing spondylitis)

Pediatrics

Key points

- **Paracetamol 15 mg/kg IV** to maximum of 1000 mg
- $20 \text{ ml/kg IV NS bolus up to } 500 \text{ ml}$

References

- American College of Surgeons Committee on Trauma; American College of Emergency Physicians; National Association of EMS Physicians. Spinal motion restriction in the trauma patient: a joint position statement. *Prehosp Emerg Care.* 2018;22(6):673–678.
- American College of Surgeons Committee on Trauma. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago, IL: American College of Surgeons; 2018.
- Hansebout RR, Kachur E. Acute traumatic spinal cord injury. In: Post TW, ed. UpToDate. Waltham, MA: UpToDate Inc; 2018.
- Dave S, Dahlstrom JJ, Weisbrod LJ. Neurogenic shock. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. Updated October 29, 2023.

MASS CASUALTY INCIDENT TRIAGE

Definition:

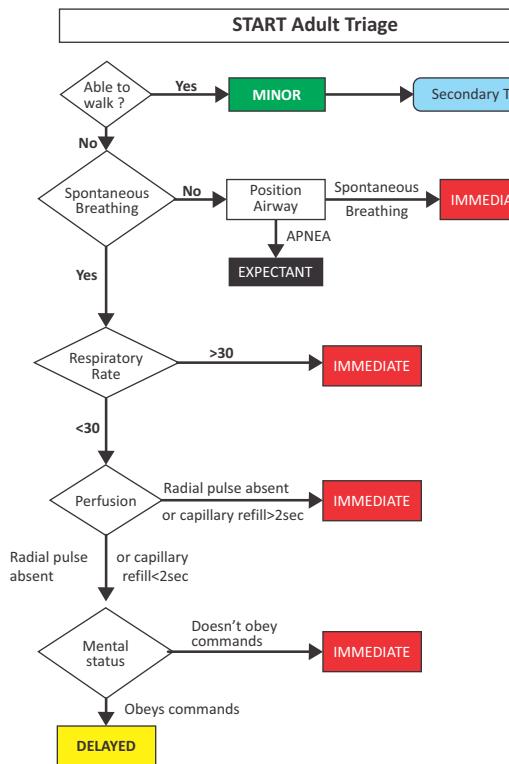
Mass Casualty Incident is when the number of patients exceed immediately available EMS resources.
Use **START** triage at all **Mass Casualty Incidents (MCI)**

Key points

- Provide EMTs with a **rapid, standardized triage method** to identify, prioritize and tag patients.
- Spend ≤ 30 seconds to triage each patient.
- Do not engage in prolonged treatment.**
- Correct **only immediate life threats** (open airway, stop massive bleeding).
- Use **standardized color-coded triage tags** (red, yellow, green and black). Tags must be clearly visible on patients.
- If the patient can walk → tag **GREEN**.
- Perform triage rapidly based on: **RPM** • **Respiration** • **Perfusion** • **Mental Status**
- Re-triage** as resources arrive and patient conditions change.

Priority	Color Code	Category	Description
1	● RED	IMMEDIATE	Life-threatening injuries requiring immediate intervention
2	● YELLOW	DELAYED	Serious but not immediately life-threatening injuries
3	● GREEN	MINOR	Walking wounded; minor injuries; may assist in own care
No Priority	● BLACK	EXPECTANT/DEAD	Not breathing after airway repositioning or incompatible with survival

TRIAGE PROTOCOL



Triage Categories

EXPECTANT

- Victim unlikely to survive given severity of injuries, level of available care, or both
- Palliative care and pain relief should be provided

IMMEDIATE

- Victim can be helped by immediate intervention and transport
- Requires medical attention within minutes for survival (up to 60)
- Includes compromises to patient's Airway, Breathing, Circulation

DELAYED

- Victim's transport can be delayed
- Includes serious and potentially life-threatening injuries, but status not expected to deteriorate significantly over several hours.

MINOR

- Victim with relatively minor injuries
- Status unlikely to deteriorate over days
- May be able to assist in own care: "Walking Wounded"

References

- Adopted from <http://www.start-triage.com>

ABBREVIATIONS

2-PAM	PRALIDOXIME	G	GAUGE
ABA	AMERICAN BURN ASSOCIATION	GCS	GLASGOW COMA SCALE
ACS	ACUTE CORONARY SYNDROME	GI	GASTROINTESTINAL
ACLS	ADVANCED CARDIAC LIFE SUPPORT	GIB	GASTROINTESTINAL BLEEDING
AED	AUTOMATED EXTERNAL DEFIBRILLATOR	GRBS	CAPILLARY BLOOD GLUCOSE
A-Fib	ATRIAL FIBRILLATION	GSW	GUNSHOT WOUND
AHA	AMERICAN HEART ASSOCIATION	GYN	GYNECOLOGY
AMI	ACUTE MYOCARDIAL INFARCTION	H	HOUR
AMS	ALTERED MENTAL STATUS	HR	HEART RATE
AP	ANTEROPOSTERIOR	ICH	INTRACRANIAL HEMORRHAGE
ASAP	AS SOON AS POSSIBLE	IM	INTRAMUSCULAR
BIPAP	BILEVEL POSITIVE AIRWAY PRESSURE	INR	INTERNATIONAL NORMALIZED RATIO
BMV	BAG-MASK VENTILATION	IV	INTRAVENOUS
BP	BLOOD PRESSURE	IVF	INTRAVENOUS FLUIDS
BPM	BEATS PER MINUTE	IO	INTRAOSSEOUS
BRUE	BRIEF RESOLVED UNEXPLAINED EVENT	KCL	POTASSIUM CHLORIDE
CAB	CIRCULATION, AIRWAY, BREATHING	KG	KILOGRAM
CHF	CONGESTIVE HEART FAILURE	KVO	KEEP VEIN OPEN
COPD	CHRONIC OBSTRUCTIVE PULMONARY DISEASE	L	LITER
CNS	CENTRAL NERVOUS SYSTEM	LMA	LARYNGEAL MASK AIRWAY
CO	CARBON MONOXIDE	LMP	LAST MENSTRUAL PERIOD
CPAP	CONTINUOUS POSITIVE AIRWAY PRESSURE	LOC	LEVEL OF CONSCIOUSNESS
CSF	CEREBROSPINAL FLUID	LR	LACTATED RINGER'S
CVA	CEREBROVASCULAR ACCIDENT	MA	MILLIAMPS
DBP	DIASTOLIC BLOOD PRESSURE	MAT	MULTIFOCAL ATRIAL TACHYCARDIA
DCAP-BTLS	DEFORMITY, CONTUSION, ABRASION, BURN, TENDERNESS, LACERATION, SWELLING	MCG	MICROGRAMS
DKA	DIABETIC KETOACIDOSIS	MEQ	MILLIEQUIVALENTS
DL	DECILITER	MG	MILLIGRAMS
ECG	ELECTROCARDIOGRAM	MGSO ₄	MAGNESIUM SULFATE
EMS	EMERGENCY MEDICAL SERVICES	MIN	MINUTES
ETT	ENDOTRACHEAL TUBE	ML	MILLILITERS
		MM	MILLIMETERS
		MMHG	MILLIMETERS OF MERCURY
		MMOL	MILLIMOLES
		NBM	NOTHING BY MOUTH
		NIHSS	NATIONAL INSTITUTE OF HEALTH STROKE SCALE
		NGT	NASOGASTRIC TUBE

NPA	NASOPHARYNGEAL AIRWAY
NRBM	NON-REBREATHER MASK
NS	NORMAL SALINE
NSAID	NONSTEROIDAL ANTIINFLAMMATORY DRUGS
O ₂	OXYGEN
OB	OBSTETRICS
OPA	OROPHARYNGEAL AIRWAY
PAC	PREMATURE ATRIAL CONTRACTION
PCI	PERCUTANEOUS CORONARY INTERVENTION
pCO ₂	PARTIAL PRESSURE OF CARBON DIOXIDE
PDE-5	PHOSPHODIESTERASE TYPE 5 INHIBITOR
PE	PULMONARY EMBOLISM
PEA	PULSELESS ELECTRICAL ACTIVITY
PO	PER OS (BY MOUTH)
PR	PER RECTUM
PPH	POSTPARTUM HEMORRHAGE
PRN	AS NEEDED
PVC	PREMATURE VENTRICULAR CONTRACTION
ROSC	RETURN OF SPONTANEOUS CIRCULATION
RR	RESPIRATORY RATE
RTA	ROAD TRAFFIC ACCIDENT
SAH	SUBARACHNOID HEMORRHAGE
SBP	SYSTOLIC BLOOD PRESSURE
SEC	SECONDS
SL	SUBLINGUAL
SOB	SHORTNESS OF BREATH
SpO ₂	SPOT OXYGEN SATURATION
SVT	SUPRA-VENTRICULAR TACHYCARDIA
STEMI	ST-ELEVATION MYOCARDIAL INFARCTION
T	TEMPERATURE
TBSA	TOTAL BURN SURFACE AREA
TCP	TRANSCUTANEOUS PACING
TKO	TO KEEP VEIN OPEN
VF	VENTRICULAR FIBRILLATION
VT	VENTRICULAR TACHYCARDIA

MEDICATIONS

ADENOSINE	MANNITOL
ADRENALINE	METHYLERGONOVINE
AMIODARONE	METOPROLOL
AMYL NITRATE	MIDAZOLAM
ASPIRIN	MISOPROSTOL
ATROPINE	NALOXONE (NARCAN)
CALCIUM CHLORIDE	NIFEDIPINE
CALCIUM GLUCONATE	NITROGLYCERIN
CARBOPROST	NITROPRUSSIDE
CHARCOAL (ACTIVATED)	NORADRENALINE
DEXTROSE	NORMAL SALINE
DIAZEPAM	OCTREOTIDE
DILTIAZEM	OXYTOCIN
DIPHENHYDRAMINE	PANTOPRAZOLE
DOBUTAMINE	PARACETAMOL
DOPAMINE	PHENIRAMINE
FUROSEMIDE	PHENYTOIN
GLUCAGON	PRALIDOXIME (2-PAM)
GLUCOSE (ORAL)	PREDNISOLONE
HALOPERIDOL	PREDNISONE
HYDRALAZINE	RANITIDINE
HYDROCORTISONE	SALBUTAMOL
HYDRYXOCOBALAMIN	SNAKEBITE ANTISERUM
IPRATROPIUM	SODIUM BICARBONATE
LABETALOL	SODIUM THIOSULFATE
LACTATED RINGER'S	SORBITRATE
LIGNOCAINE	THIAMINE
LORAZEPAM	TRAMADOL
MAGNESIUM SULFATE	VASOPRESSIN