Newborn Critical Care Center (NCCC) Clinical Guidelines

Guidelines for the Management of Hyperkalemia

Definition: In the newborn, hyperkalemia is defined as a potassium level > 6 mmoL/L in a non-hemolyzed blood specimen. Verification of potassium level via venous or arterial sampling is recommended due to spurious lab values associated with hemolyzed specimens. This verification should **NOT** delay treatment in the case of a symptomatic infant.

Etiology: The etiology of hyperkalemia can be due to:

1. Increased intake
    a. **Iatrogenic from IV fluid administration -** consider sending IV fluids for laboratory analysis of potassium content if reason for hyperkalemia is unclear
    b. Increased potassium load from blood transfusion (especially if blood is not fresh)
2. Redistribution of potassium from the intracellular to extracellular compartment
    a. Metabolic acidosis
    b. Intravascular hyperosmolality
    c. Tissue breakdown causing the release of potassium from the cell into extracellular fluid (e.g. trauma, severe hypothermia, hemolysis)
3. Decreased renal excretion
    a. Impaired kidney function
    b. Absence of or resistance to aldosterone (e.g. CAH, aldosterone synthase deficiency)

Serum potassium > 6 mmoL/L but < 7 mmoL/L (non-hemolyzed)

1. Remove all sources of exogenous potassium (i.e. IV fluids and enteral feeds). Rehydrate if necessary.
2. Obtain STAT 12 lead ECG
    a. **If ECG changes are present, proceed to medical management (described in later section)**

    ECG findings progress with increasing serum potassium:

    Peaked T waves → Flattened P waves and increasing PR interval → QRS widening and slurring → Supraventricular/ventricular tachycardia, bradycardia, or ventricular fibrillation

    b. In the absence of ECG changes, expectant management is appropriate. Serial serum potassium levels (based on clinical circumstances) to establish trend

Serum potassium ≥ 7 mmoL/L (non-hemolyzed)

1. Remove all sources of exogenous potassium. Rehydrate if necessary.
2. Obtain STAT 12 lead ECG, however, **medical management is recommended even in the absence of ECG changes** (next section).

Medical Management

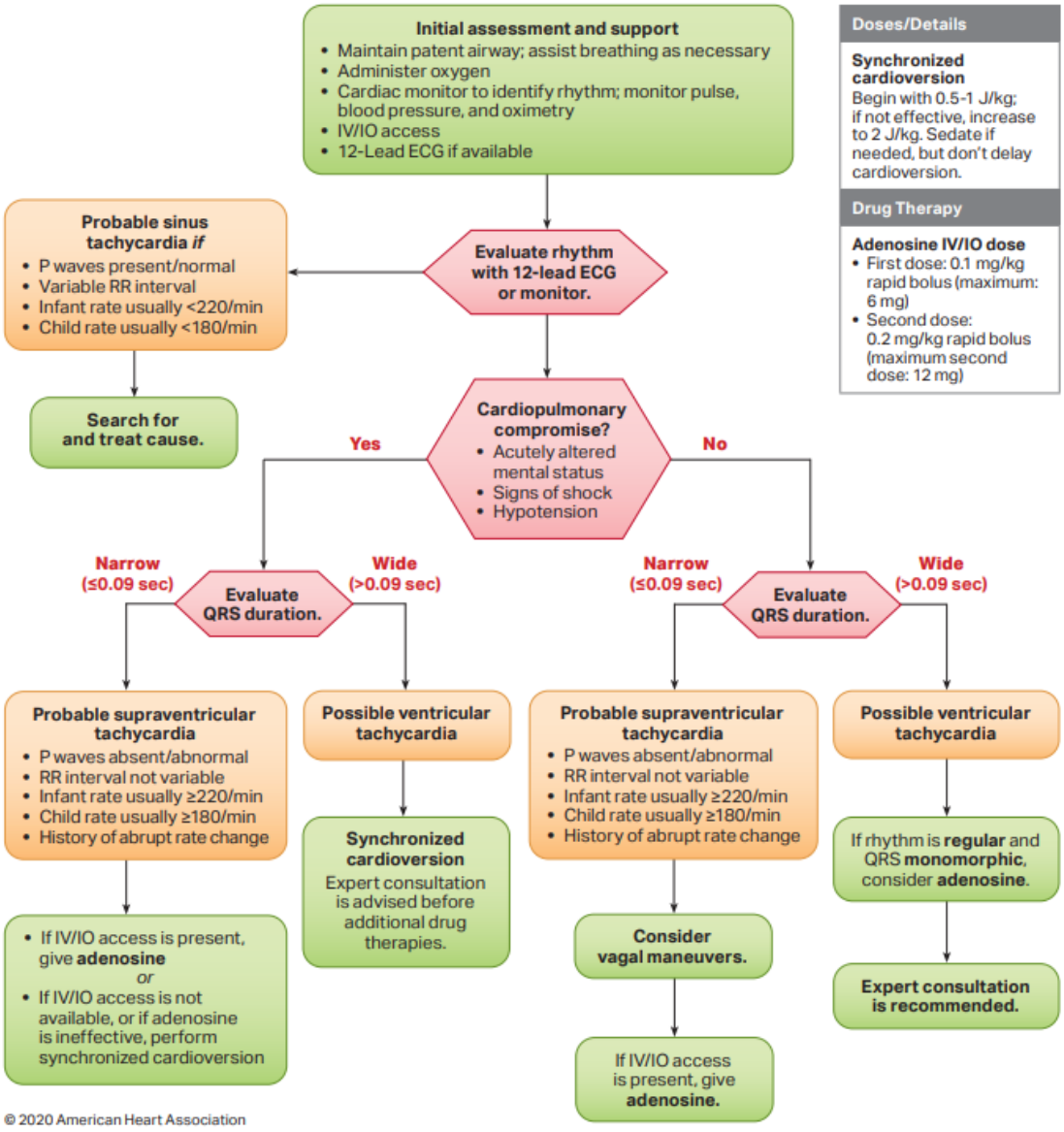
Clinical status, infant factors, ECG, and serum K level all affect the choice of therapies.

Utilize EPIC Order Panel "Pediatric Acute Hyperkalemia" and consider combinations of the following therapies:

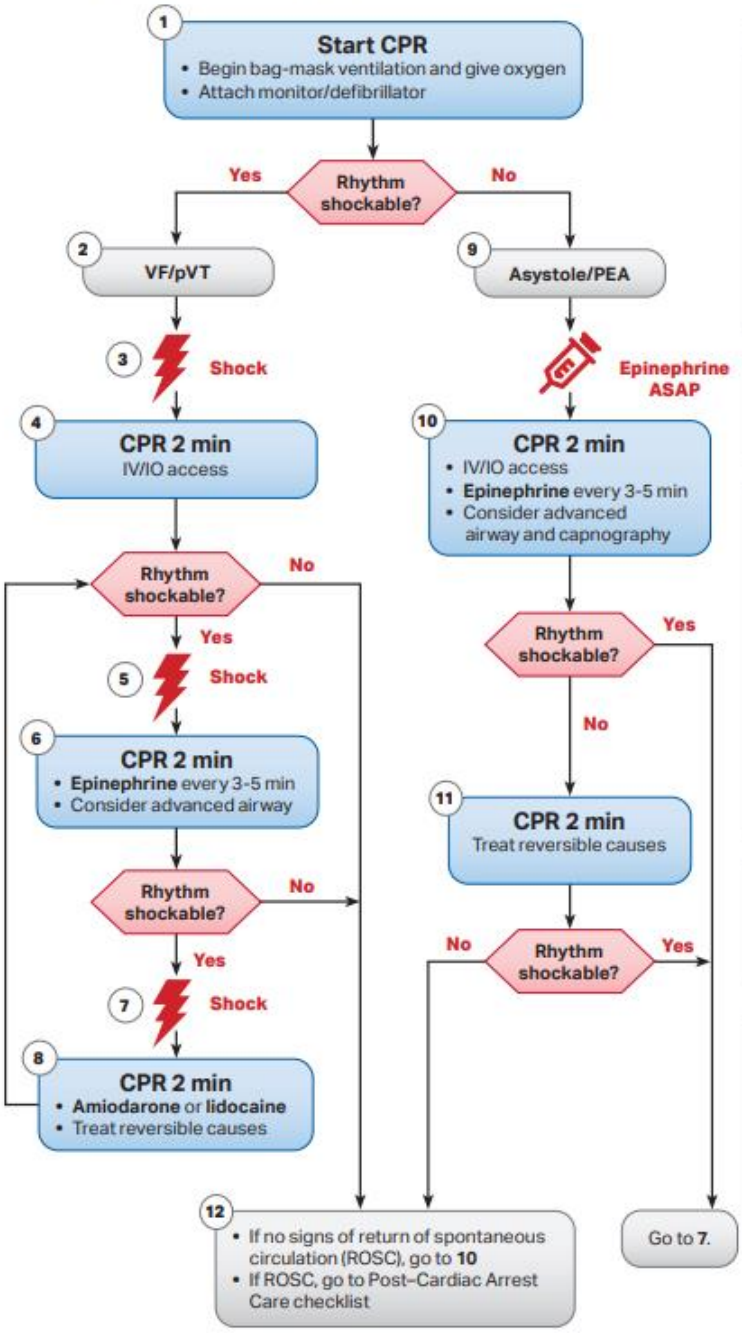
1. *Stabilize conducting tissues*
    a. **Administer calcium gluconate (10%) 100 mg/kg IV over 10-30 minutes.** Calcium increases the threshold resting membrane potential at which excitation occurs but does nothing to alter serum potassium levels. The effects last 30-60 minutes, so repeat doses may be needed until more definitive methods to lower serum potassium are established.
2. *Shift potassium into the intracellular space*
    a. Insulin and glucose: **Begin with a 0.05 unit/kg bolus of human regular insulin with 2mL/kg of D10W** followed by continuous infusion of D10W at the necessary rate to maintain adequate hydration. For continued hyperkalemia, consider an infusion of human regular insulin at 0.05 - 0.1 units/kg/hr. Blood sugars should be monitored closely to evaluate for hypoglycemia or hyperglycemia.
    b. Albuterol: **Albuterol Sulfate nebulized STAT 0.4 mg x 1.** Onset of action is rapid with the effects lasting up to 2 hours. Tachycardia is the main side effect.
    c. Sodium bicarbonate: Alkalemia promotes intracellular potassium for hydrogen-ion exchange. **Administer sodium bicarbonate (4.2%) 1-2 mEq/kg/dose IV over 30-60 minutes.** To reduce the risk of IVH, avoid rapid administration in infants born before 34 weeks gestation and younger than 3 days of age. Resultant pH change may not be sufficient to markedly shift potassium (K+) ions. A combination of albuterol and insulin with dextrose may be more effective in lowering serum potassium.
3. *Remove excess potassium from the body*
    a. Loop diuretics: Loop diuretics prevent the reabsorption of sodium and potassium in the loop of Henle and directly increase urinary potassium excretion. **Furosemide 1mg/kg IV** may be of therapeutic value in patients who do not have chronic or end-stage renal disease.
    b. Cation exchange resins: Kayexalate may be administered per rectum (PR) by inserting a thin silastic feeding tube 1-3 cm into the rectum. **Administer 1 g/kg in NS at 0.5 g/mL with a minimum retention time of 30 minutes. *This is not recommended in preterm infants or infants with bowel compromise*.**
    c. Peritoneal dialysis/Double volume exchange transfusion: May consider if the patient's clinical condition and etiology of hyperkalemia suggest a reasonable chance for favorable long-term outcome.

ECG Changes Refractory to Medical Management

Pediatric Tachycardia With a Pulse Algorithm



Pediatric Cardiac Arrest Algorithm



CPR Quality

- Push hard (≥⅓ 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

- **H**ypovolemia
- **H**ypoxia
- **H**ydrogen ion (acidosis)
- **H**ypoglycemia
- **H**ypo-/hyperkalemia
- **H**ypothermia
- **T**ension pneumothorax
- **T**amponade, cardiac
- **T**oxins
- **T**hrombosis, pulmonary
- **T**hrombosis, coronary