NHS CATS
Children's Acute Transport Service

Clinical Guidelines

Hyperkalaemia

Document Control Information

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Applicable to	All CATS employees		

Cardiac arrest with hyperkalaemia

- This may be VF, pulseless VT, asystole or PEA
- In all scenarios it is difficult to re-establish sinus rhythm without lowering the serum potassium
- Give the following:
    - 10% calcium gluconate 0.5ml/kg **IV (max. 30ml)** over 2-5 minutes
    - Sodium bicarbonate 1-2mmol/kg IV (max 50mmol) 1mmol = 1ml of 8.4% solution)
    - Consider insulin/glucose bolus as follows: IV bolus of 0.1units/kg (max 10units) human soluble insulin (Actrapid®) WITH 10mL/kg 10% glucose

What is Hyperkalaemia & when should I treat?

Hyperkalaemia is defined as potassium (K+) >5.5mmol/L

- Mild: K^+ 5.5 – 6.0
- Moderate: K^+ 6.1 - 6.9
- Severe: K^+ > 7.0

ECG changes are typically progressive and are not usually seen below potassium levels of 7mmol/L

How rapidly potassium rises may be more important than how high the actual level is:

- Patients without ECG changes can suddenly go into cardiac arrest
- A child with chronic renal failure may tolerate high levels of potassium without any ECG change

Treat if:

- K+ levels are > 6.0mmol/L
- ECG changes are present

Each case should be considered carefully, and *treatment instigated promptly*, without waiting for laboratory confirmation or repeat blood test results, in acutely unwell children especially patients with:

- Suspected renal impairment
- Oliguria
- Significant acidosis
- ECG changes

Beware assuming collection technique ("squeezed sample") is to blame - if in doubt, treat.

Causes of Hyperkalaemia

Increased load

- Iatrogenic - infusion, transfusion of old blood

Shift of potassium into the extracellular space

- Excessive cell breakdown: haemolysis, tumour lysis, rhabdomyolysis, burns, trauma
- GI bleed
- Acidosis
- Familial hyperkalaemic periodic paralysis
- Hyperosmolar states: uncontrolled diabetes, glucose infusions

Decreased excretion

- Renal failure – acute or chronic
- Congenital adrenal hyperplasia
- Addison's disease
- Primary hypoaldosteronism/pseudohypoaldosteronism
- Type IV RTA
- Potassium sparing diuretics

Examples of drugs which may cause hyperkalaemia:

- ACE inhibitors, digoxin, suxamethonium, spironolactone

Pseudohyperkalaemia

- Sampling error - drawn from the same line as potassium infusion
- Laboratory error
- Leucocytosis and/or thrombocytosis

Management

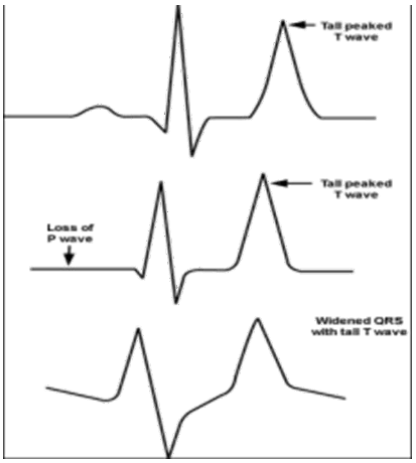
ABC assessment as per APLS:

Airway

- If indication for intubation, avoid use of suxamethonium, which can exacerbate hyperkalaemia.

Breathing

- If mechanically ventilated, consider aiming for mild respiratory alkalosis by increasing the rate



Circulation

- Start continuous ECG monitoring immediately and check the blood pressure
- Place appropriately sized defibrillator pads on the patient.
- 12 lead ECG
- Repeat U&E & blood gas to be sent emergently
- Treat arrhythmias as per APLS protocols - the child may present with:
  - Peaked T waves or loss of P wave
  - Widened QRS
  - Bradycardia
  - Junctional rhythm
  - VT, VF

Specific treatment

1. Stop all exogenous potassium

- Potassium containing intravenous (IV) fluids and parenteral nutrition
- Enteral potassium supplements
- Drugs affecting potassium accumulation
- Stop red blood cell transfusions

2. Membrane stabilisation - to antagonise the effects of potassium but will NOT lower potassium

10% Calcium Gluconate

- If ECG changes present, give *0.5ml/kg IV (max. 30ml) of 10% calcium gluconate* over 5-10minutes. Administration: Central iv access: can give neat. Peripheral: dilute to a maximum concentration of 0.045mmol calcium in 1ml
- If ECG changes are still present after 5 minutes, a repeat dose can be given.

3. Decrease serum potassium levels - by promoting the movement of potassium intracellularly

Salbutamol

- Can be given as *salbutamol nebulisation (2.5- 5mg, repeated if necessary) or intravenously 4micrograms/kg (max 250micrograms)*
- Do not use as sole therapy in moderate/severe hyperkalaemia as 25-40% of people do not show hypokalaemic effect with salbutamol.

Insulin/glucose therapy

- Start human soluble insulin (Actrapid®) infusion: neonates: 0.3 – 0.6 units/kg/hr, > 1 month 0.05 - 0.2units/kg/hour with glucose 0.5-1g/kg/hr (i.e. 5-10ml/kg/hr of glucose 10%)
- Insulin should always be given with a glucose infusion to avoid hypoglycaemia.
- Insulin & glucose should run through the same cannula to ensure both infusions stop if the IV-line blocks or leaks. Ensure the octopus being used has non return valves on each lumen.
- Glucose and K^+ levels should both be monitored.
- Aim for glucose > 6mmol/L and monitor levels every 15 minutes for the first hour.

Sodium Bicarbonate IV

- If severe acidosis is present, give 1mmol/kg (max 50mmol) sodium bicarbonate iv (1mmol = 1ml of 8.4% solution)- may be repeated if needed

4. Removing potassium from the body

Furosemide

- 1 – 5mg/kg iv (max 50mg) may be effective depending upon renal status

Calcium polystyrene sulfonate (calcium resonium)

- Calcium polystyrene sulfonate is not used for acute treatment of hyperkalaemia

Renal replacement therapy (CRRT, PD or HD)

- Discuss with CATS consultant

Transport considerations

- During transport, monitor patient's ECG through pads on defibrillator. Remember to place pads on before securing in baby pod or ACR.
- Insulin & glucose should run through the same cannula to ensure both infusions stop if the IV-line blocks or leaks. Ensure the octopus being used has non-return valves on each lumen.
- Glucose level may need to be monitored depending on transit time.
- Prepare boluses of calcium gluconate, adrenaline (arrest dose), sodium bicarbonate and glucose, as well as sodium chloride 0.9% for flushes.
- Have intraosseous equipment easily accessible.

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