GUIDELINE FOR THE MANAGEMENT OF ACUTE HYPERKALAEMIA IN ADULTS

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Intended audience	All Manx Care employees	
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1. INTRODUCTION

Purpose

This document aims to guide the user on the safe and effective management of hyperkalaemia in patients.

Scope

This document applies to all clinical staff who may have to deal with patients with raised potassium levels. This includes Primary Care staff as well as those based within the Acute service.

2. RELATED POLICY/STRATEGY/LEGISLATION/GUIDANCE

This document was prompted by a UK National Patient Safety Alert issued by the Medicines and Healthcare Regulatory Agency (MHRA) in June 2023 highlighting the risk of using the incorrect dose of calcium, as the gluconate and chloride salts are not equivalent. This document is available at https://www.cas.mhra.gov.uk/ViewandAcknowledgment/ViewAlert.aspx?AlertID=103234

The MHRA also published a Drug Safety Update article available at https://www.gov.uk/drug-safety-update/calcium-chloride-calcium-gluconate-potential-risk-of-underdosing-with-calcium-gluconate-in-severe-hyperkalaemia

These guidelines rely to a large degree on Clinical Practice Guidelines on the Treatment of Acute Hyperkalaemia in Adults, published by the Renal Association in 2020. These are available at https://ukkidney.org/sites/renal.org/files/RENAL%20ASSOCIATION%20HYPERKALAEMIA%20GUIDELINE%20-%20JULY%202022%20V2_0.pdf

3. GUIDELINE

3.1 Hyperkalaemia Definition

The reference range for serum potassium in adults is 3.5 – 5.3 mmol/L.

Hyperkalaemia is classified as follows:

Mild Hyperkalaemia	Moderate Hyperkalaemia	Severe Hyperkalaemia
5.4 – 5.9 mmol/L	6.0 – 6.4 mmol/L with normal ECG	6.5 mmol/L or higher or ≥6.0 mmol/L with ECG changes
Routine review. No immediate action required unless symptomatic.	Urgent review or treatment required.	Emergency treatment required.

Beware of falsely raised potassium levels (pseudohyperkalaemia). This could occur if the blood sample haemolysed; there is thrombocytosis; there is leucocytosis; the venepuncture involved prolonged tourniquet use, small needle calibre, excessive fist clenching, or excessive plunger force to withdraw blood into the syringe.

3.2 Causes of Hyperkalaemia

3.2.1 Renal Causes

- Acute Kidney Injury (AKI)
- Chronic Kidney Disease (CKD)
- Medication which interferes with renal potassium excretion (e.g. spironolactone, trimethoprim).
- Medication which interferes with the renal-angiotensin-aldosterone system (e.g. ACE inhibitors, angiotensin receptor antagonists, NSAIDs, heparins.)
- Mineralocorticoid deficiency.

3.2.2 Transcellular Shift (intracellular to extracellular)

- Acidosis, including diabetic ketoacidosis (DKA)
- Medication (e.g. digoxin toxicity, suxamethonium, beta-blockers)
- Acute tumour lysis
- Burns
- Rhabdomyolysis

3.2.3 Other causes

- Heart failure
- Massive blood transfusion
- Dietary factors, or use of salt substitutes
- Medication, such as potassium supplementation

3.3 Symptoms of Hyperkalaemia

- ECG abnormalities – **this requires emergency treatment**
- Muscle weakness
- Ascending paralysis (seen in severe hyperkalaemia)
- Paraesthesia
- Muscle cramps
- Hyperreflexia
- Cardiac arrest
- Nausea and vomiting
- Diarrhoea

3.4 Management and Monitoring

In Primary Care, if **mild** hyperkalaemia is detected unexpectedly and the patient is stable, check serum potassium again within 3 days, or as soon as is feasible.
If **moderate** hyperkalaemia (without ECG changes) is detected, serum potassium should be repeated within 1 day. Consider referral if the patient is clinically unwell or has AKI.

manx care
Kiarail Vannin

EMERGENCY MANAGEMENT OF HYPERKALAEMIA IN ADULTS

Assess the Patient

ADOPT AIRWAY BREATHING CIRCULATION DISABILITY EXPOSURE (ABCDE) APPROACH
Seek expert help NOW if airway, breathing or circulation are compromised.

MILD
K^+ 5.5 - 5.9 mmol/L
Consider cause and whether treatment is indicated.

MODERATE
K^+ 6.0 - 6.4 mmol/L
Treatment is guided by clinical scenario and ECG.

SEVERE
$K^+ \geq 6.5$ mmol/L
Emergency treatment indicated.

Seek expert help.

12 LEAD ECG
Ensure continuous ECG monitoring if your patient has ECG changes, or if their potassium level is ≥ 6.5 mmol/L.

ARE ACUTE ECG CHANGES PRESENT?

- Peaked T-waves
- Flat / Absent P waves
- Broad QRS
- Sine wave
- Bradycardia
- Ventricular tachycardia

Protect the Heart

NO

YES

GIVE INTRAVENOUS CALCIUM
30mL of 10% calcium gluconate or **10mL of 10% calcium chloride**
Give over 5-10 minutes into a large vein.
Repeat this dose once after 5-10 minutes if there are persistent ECG changes.

Shift Potassium Into Cells

GIVE INSULIN-GLUCOSE IV INFUSION
Give 10 units of soluble insulin (Actrapid) in 125mL of 20% glucose over 15 minutes.
(Can use 50mL of 50% glucose if using a large or central vein.)

Monitor for hypoglycaemia at 0, 15, 30, 60 and 90 minutes, and then hourly at 2-12 hours.

If the patient's pre-treatment blood glucose level was <7.0 mmol/L, follow insulin-glucose with a glucose infusion.
250mL of 10% glucose run at 50 mL/hour for 5 hours.

CONSIDER NEBULISED SALBUTAMOL
10-20mg given via nebuliser.

Remove Potassium

IS SERUM POTASSIUM ≥ 6.5 mmol/L DESPITE TREATMENT?

CONSIDER CALCIUM RESONIUM
(Off-label unless on dialysis or anuric or severely oliguric)
Oral: 15g 3-4 times a day
OR
Rectal: 30g twice a day
INCLUDE LACTULOSE
15mL orally TWICE A DAY

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Rectal: 30g twice a day
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15mL orally TWICE A DAY

NO

YES

CONSIDER HAEMODIALYSIS
Seek expert advice

Monitor and Prevent

MONITOR POTASSIUM
As a minimum at 2, 4, 6 and 24 hours.

CONSIDER CAUSES AND PREVENT FURTHER RISE OR RECURRENCE
Review NSAIDs, ACE inhibitors, angiotensin II receptor blockers, potassium-sparing diuretics, beta-blockers, digoxin and heparins.

3.4.1 Calcium Gluconate Injection 10% or Calcium Chloride Injection 10%

See flowchart.

- Note that this protects the heart. It does NOT lower potassium.
- Do not give in patients with hypercalcaemia.

Please be careful with doses.
A larger volume of calcium gluconate is required for the same calcium dose as calcium chloride.

Calcium gluconate 10%: The usual dose is **30mL**.
Calcium chloride 10%: The usual dose is **10mL**.

- Use a large vein if possible. Central administration is preferred if possible. Extravasation can cause tissue necrosis.
- The dose can be repeated after 5-10 minutes if necessary.
- If your patient takes digoxin, rapid administration of calcium may precipitate myocardial toxicity. For these patients, consider giving calcium gluconate as a short infusion rather than as a bolus. Dilute 30mL of calcium gluconate 10% with 100mL sodium chloride 0.9% or glucose 5%, and give over 20-30 minutes.

3.4.2 Soluble Insulin-Glucose IV Infusion

See flowchart.

- Use an insulin syringe to measure the 10 units of insulin.
- Use a large vein. Central administration is preferred if possible.
- Monitor closely for hypoglycaemia for 12 hours after treatment.
- Patients with a baseline glucose level <7.0 mmol/L should receive a glucose infusion (10% glucose at a rate of 50 mL/hour for 5 hours).
- Serum potassium may fall by up to 1 mmol/L.

3.4.3 Nebulised Salbutamol

See flowchart.

- Use with caution in cardiovascular disease.
- High doses can precipitate arrhythmias. Avoid in patients with tachyarrhythmia, and limit the dose to 10mg in those with a history of ischaemic heart disease.

3.4.4 Calcium Resonium

See flowchart.
Note that the use of calcium resonium is off-label unless the patient is on dialysis, or has anuria or severe oliguria.

- The oral route is preferable.
- Onset is slow and variable, and it can take hours or days to see reduced potassium levels.
- Oral calcium resonium may prevent absorption of oral medication. Separate from oral medicines by at least 3 hours if possible.
- Co-prescribe lactulose 15mL twice a day to counter the constipating effect, unless lactulose is contraindicated.

4. REFERENCES AND/OR RESOURCES

Summary of Product Characteristics – Calcium gluconate 10% solution for injection/infusion BP, Hameln, revised 13/06/2023. Accessed on 7/7/23 via www.medicines.org.uk

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