Grampian Medicines Information Centre

Pharmacy Department
Aberdeen Royal Infirmary
Foresterhill
Aberdeen, AB25 2ZN

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Enquiries to: Sarah O'Beirne
Extension: 52316
Direct Line: 01224 552316
Email: Gram.medinfo@nhs.scot

Alternative to calcium gluconate injection 10% w/v for treatment of hyperkalaemia

See the full guideline for detailed guidance on the management of hyperkalaemia.

Situation

Calcium gluconate injection 10% w/v may be temporarily out of stock during June 2024.
Intravenous calcium is given during the treatment of hyperkalaemia, where ECG changes are present, to protect the heart against arrhythmias. Calcium gluconate is the preferred calcium salt for this indication (excluding resuscitation).

Action required

If treatment with intravenous calcium is required, and if calcium gluconate is unavailable, calcium chloride can be used.

Note: calcium gluconate 10% w/v and calcium chloride 14.7% w/v **do not** contain equivalent amounts of calcium.

Dose: 6.8ml calcium chloride 14.7% (10 mmol in 10ml) over 5 minutes preferably via a central venous access device.

Calcium chloride solution has a high osmolarity and may cause venous irritation and tissue damage in cases of extravasation. This is more common with the chloride salt than the gluconate salt.

If a central venous access device is unavailable, administer via a large peripheral vein monitoring insertion site closely using a recognised phlebitis scoring tool. Re-site cannula at first signs of inflammation.
Use of calcium chloride for treatment of hyperkalaemia is off-label.

Monitoring: Ensure visible bedside ECG, blood pressure and heart rate monitoring are in place.
See full guidance for more detailed information on monitoring.

Created by Sarah O'Beirne, Lead Pharmacist, Grampian Medicines Information Centre, ARI.
Contact for query, clarification or feedback: 01224 552316, or gram.medinfo@nhs.scot

Hyperkalaemia Treatment Summary Flowchart

Use in conjunction with "NHS Grampian Staff Guideline for the Management of Acute Hyperkalaemia Treatment in Adults

For each medication, please see detailed information on next page
[senior = registrar or consultant or GP, as appropriate]

Hyperkalaemia (serum potassium ≥ 5.4mmol/L)

Airway Breathing Circulation Disability Exposure (ABCDE) approach
Seek advice from seniors if A, B or C are compromised
Record NEWS score

Mild
5.4 – 5.9mmol/L

Consider and address **causes**

Consider **calcium resonium**
To remove potassium

Moderate
6.0 – 6.4mmol/L

12 lead ECG
Ensure continuous ECG monitoring in place if Moderate Hyperkalaemia with ECG changes or Severe Hyperkalaemia

Acute ECG changes present?

No

Yes

Get senior assistance and treat as an emergency
If based in primary care, will require admission to Acute

Severe
≥6.5mmol/L

Get senior assistance and treat as an emergency

INSULIN-GLUCOSE*

If prescribing insulin-glucose infusion, monitor capillary blood glucose at:

- Baseline
- 15 minutes
- 30 minutes
- 60 minutes
- 90 minutes
- 2 hours
- 3 hours
- 4 hours
- 6 hours
- 8 hours
- 12 hours

Using NHS Grampian Blood Glucose Monitoring Record

Nebulised salbutamol
For intracellular potassium shift
Give 10-20mg via nebuliser

+

Insulin-glucose intravenous infusion*
For intracellular potassium shift
Give 8 units soluble insulin (i.e. Actrapid) in 100mL 20% glucose over at least 15 minutes

Calcium gluconate injection 10% w/v
To protect heart
Give 30mL (6.6mmol calcium) over 10 minutes using large vein.
Can repeat at 5-10 minute intervals until ECG normalises . Use infusion in patients on digoxin – see overleaf.

Start infusion of glucose 10% at 50mL/hour for 5 hours in patients with a pre-treatment blood glucose <7.0mmol/L to avoid hypoglycaemia
If patient is fluid-restricted, see guidance overleaf.

Consider causes and address to prevent occurrence
Senior review may be necessary

Consider dialysis
Refer to Renal team
(e.g. CKD or serum potassium ≥6.5mmol/L despite treatment or ongoing tissue damage (e.g. severe rhabdomyolysis))

Sodium zirconium cyclosilicate
Restricted use in renal department.

Monitor serum potassium at a minimum of 2, 4, 6, and 24 hours

Calcium gluconate injection 10% W/V

- Function: Protect the heart
- NB: does not lower potassium
- Ensure visible bedside ECG and blood pressure monitoring are in place
- **Dose:** administer 30mL (6.6mmol calcium) calcium gluconate 10%w/v injection intravenously
- Use a large vein. Central administration is preferred if immediately available.
- Give over 10 minutes.
- Give as infusion over 20-30 minutes in patients on **digoxin** (e.g. dilute 30mL 10% calcium gluconate injection in 100mL sodium chloride 0.9% or glucose 5%)
- Flush with sodium chloride 0.9%
- Onset of action: 1-3 minutes
- Can repeat dose at 5-10 minute intervals until ECG features of hyperkalaemia have normalised.
- Duration of action: 30-60 minutes
- Contraindications: hypercalcaemia
- Caution: May potentiate arrhythmias in digoxin toxicity
- Extravasation can cause tissue necrosis

Soluble insulin-glucose intravenous infusion

- Function: move potassium into cells
- **Dose:** 8 units soluble insulin (i.e. Actrapid) in 100mL 20% glucose over at least 15 minutes
- Use an insulin syringe to measure the insulin
- Use a large vein. Central administration is preferred if immediately available.
- Risk of hypoglycaemia for up to 12 hours after treatment. Patients with End Stage Renal Disease (ESRD) are more susceptible due to decreased excretion of insulin. Monitor patient for hypoglycaemia as per the instruction box on page 6. Must be highlighted in medical and nursing notes, and at handover.
- The risk of hypoglycaemia in patients with low pre-treatment glucose concentration (<7mmol/L) may be reduced by providing additional glucose (as 10% glucose infusion at 50mL/hour for 5 hours)
- **Fluid restriction:** for patients where fluid load is a concern, treat with soluble insulin and glucose, ensure blood glucose monitoring is undertaken at the specified intervals, and only start glucose infusion if blood glucose concentration fall below <7mmol/L post treatment.
- Onset of action: within 45 minutes
- Duration of action: 2-4 hours
- Peak action: 30-60 minutes
- Serum potassium may fall by up to 1mmol/L
- Increased effectiveness if given with nebulised salbutamol
- If hypoglycaemia occurs, give dextrose tablets (e.g. Dextrose Energy) or glucose 40% gel (e.g. GlucoBoost). Avoid fruit juice given high potassium content.

Nebulised salbutamol

- Function: move potassium into cells
- **Dose:** 10-20mg via nebuliser
- Caution: cardiovascular disease. High doses can precipitate arrhythmias, use 10mg if history of Ischaemic Heart Disease.
- Onset of action: within 30 minutes
- Duration of action: up to 2 hours
- Avoid if tachyarrhythmia present
- Some patients may have limited response to nebulised salbutamol treatment (e.g. patients on non-selective beta-blockers and patients with End Stage Renal Disease)
- Serum Potassium may fall by 0.5-1mmol/L
- Do not use as monotherapy, unless in exceptional circumstances where there is no intravenous access to administer insulin and glucose

Sodium zirconium cyclosilicate

- Function: increase gastrointestinal loss of potassium
- **Dose:** 10g three times daily for up to 72 hours
- Mix the content of each 10g sachet of powder with approximately 45 mL of water and stir well. The powder will not dissolve and the suspension should be taken while it is cloudy; if the powder settles it should be stirred again.
- Onset of action: within 1 hour
- Lowers potassium by up to 1.1mmol/L within 48 hours. In patients with serum potassium >6.0mmol/L, it can lower serum potassium by 1.5mmol/L within 48 hours.
- Restricted to correction phase use within the renal department, as emergency bridging use for adults where dialysis is unavailable but urgently needed, and potassium is dangerously elevated.
- Caution: with abdominal x-rays. Sodium zirconium cyclosilicate may be opaque to x-rays.

Calcium resonium powder

- Function: remove potassium from body
- **Dose:** 15g made into a suspension using a small amount of water and given orally four times daily **OR** 30g resin in 150mL of water or 10% glucose given rectally as a retention enema twice daily.
- Oral route is preferable
- Not appropriate for emergency treatment
- Onset: slow and variable, hours to days
- Contraindications: bowel obstruction
- Administer calcium resonium at least 3 hours before or 3 hours after other oral medications. For patients with gastroparesis, a 6-hour separation should be considered.
- Consider risk of bowel obstruction and perforation
- **Oral use:** consider co-prescribing a laxative (avoid Laxido/ Movicol due to potassium content)
- **Rectal use:** Enema should be retained for at least 9 hours then colon irrigated with water by medical staff to remove resin as per SmPC.

Monitoring

If ECG changes have been identified, or if serum potassium is greater than or equal to 6.5mmol/L irrespective of ECG changes, begin continuous ECG monitoring. Consider transfer to high dependency environment.

Visible bedside monitoring should be in place before administration of intravenous calcium gluconate.

Monitor urea and electrolytes one hour post treatment. Once serum potassium is <6mmol/L, then monitor urea and electrolytes at a minimum of 2, 4, 6, and 24 hours in patients who have been treated for moderate or severe hyperkalaemia to ensure adequate treatment and detect any “rebound” rise in potassium requiring further treatment.

If, following treatment, a potassium level > 6.5mmol/L recurs, discuss with the renal team due to resistant or recurrent hyperkalaemia.

In primary care, if mild hyperkalaemia is detected unexpectedly and patient is stable, serum potassium should be repeated within 3 days, or as soon as feasible. If moderate hyperkalaemia (without ECG changes) is detected, serum potassium should be repeated within 1 day. Consider referral to hospital if clinically unwell or AKI present.