# Guideline for the Management of Acute Hyperkalaemia in Adults

| Author | Emily Payne (Clinical Pharmacist) January 2016. Guideline revised by Rosamund Bell (Clinical Pharmacist), Dr Charlotte Bebb (Consultant Renal Medicine), Anna Hill (Senior Clinical Pharmacist Fellow) September 2018 |
| Directorate & Speciality | Acute medicine |
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| Date on which guideline must be reviewed (this should be one to three years) | October 2021 |
| Explicit definition of patient group to which it applies (e.g. inclusion and exclusion criteria, diagnosis) | Applies to: All adult inpatients and outpatients referred with incidental hyperkalaemia from their GP, NEMS or the Outpatient Department. Excludes: Diabetic ketoacidosis (DKA), Paediatrics |
| Abstract | This guideline describes the management of Acute Hyperkalaemia in all adult inpatients and outpatients referred with incidental hyperkalaemia from their GP, NEMS or the Outpatient Departments |
| Key Words | Potassium, Hyperkalaemia |
| Changes from previous guideline | Changes to Summary – Initial Management of Acute Hyperkalaemia Changes to Summary – Inpatient Management of Acute Severe Hyperkalaemia flowchart Changes to Summary – Inpatient Management of Acute Moderate Hyperkalaemia flowchart Addition of specific hyperkalaemia prescription chart for potassium levels ≥6.5 or ≥6.0mmol/L with ECG changes Addition of How to prepare 10units of Actrapid® soluble insulin in 50mL of glucose 50% for the treatment of Hyperkalaemia Changes to dietary guidance |
| Approval | DTC MMC |
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| Consultation | Dr Charlotte Bebb (Consultant Renal Medicine) Dr Simon Roe (Consultant Renal Medicine) Dr Jenny Clayton (Consultant Diabetes and Endocrinology) Dr Andy Clayton (Consultant Respiratory Medicine) Dr Peter Prinsloo (Consultant Pathology) Bruno Mafrici (Renal Dietitian) Tested by Trent Simulation and Clinical Skills Centre |

This guideline has been registered with the trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date.
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Initial Management of Acute Hyperkalaemia ($K^+ \geq 6.0\text{mmol/L}$)

This guideline covers the management of hyperkalaemia in inpatients and in outpatients referred with incidental hyperkalaemia from their GP, NEMS or the Outpatient Departments. Outpatient clinic attendees with hyperkalaemia should be referred to MACU or be admitted via speciality admissions areas for assessment. This guideline does **NOT** apply to the management of hyperkalaemia in diabetic ketoacidosis (follow **DKA guideline**).

### Renal dialysis patients

Hyperkalaemia defined as $K^+ \geq 6.5\text{mmol/L}$

- Refer patient to renal team
- Request ECG
- **Repeat potassium sample** and also request “Whole Blood Potassium” (sample in a green Lithium-Heparin tube)
- Repeat potassium can be confirmed using **venous blood gas** to **avoid delay** in treatment

### All other patients

Hyperkalaemia defined as $K^+ \geq 6.0\text{mmol/L}$

- Request ECG
- **Repeat potassium sample** and also request “Whole Blood Potassium” (sample in a green Lithium-Heparin tube)
- Repeat potassium can be confirmed using **venous blood gas** to **avoid delay** in treatment

**ECG changes in hyperkalaemia** include **tall peaked T waves**, **flattening or loss of P waves**, **broadening of QRS complexes**, and **bradycardia**.

If significant hyperkalaemia or ECG changes are present do not delay treatment while awaiting the repeat result/specialist review by Renal registrar.

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**Repeat $K^+ < 6.0\text{mmol/L}$ and renal function stable.**

No urgent action required. Modify diet (see page 14 of guideline) and review medication. For outpatients, admission to hospital is not required.

**Repeat $K^+ = 6.0–6.4\text{mmol/L}$**

Refer to flowcharts on page 4 and 5

Outpatients seen by NEMS with ECG changes will be referred to ED resus for treatment.

If no ECG changes patient will be referred to Medical Ambulatory Care Unit for assessment and management.

**Repeat $K^+ \geq 6.5\text{mmol/L}$**

Refer to flowchart on page 4

Outpatients seen by NEMS will be referred to ED resus for treatment.

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Use the **Hyperkalaemia prescription chart** for calcium gluconate and insulin-glucose treatment.

Pre-printed charts are available in ward areas or can be printed from page 6 of this guideline or Guidelines section of intranet if a chart cannot be found on the ward and obtaining from another ward area would result in treatment delay.
SUMMARY - INPATIENT Management of Severe Acute Hyperkalaemia

If patient is oligo/anuric or has advanced chronic kidney disease or severe acute kidney injury (AKI) seek expert advice immediately. Begin immediate treatment for hyperkalaemia and contact Renal Registrar on-call. DO NOT use the insulin/glucose infusion in DKA (See DKA guideline).

If POTASSIUM is ≥6.5mmol/L OR ≥6.0mmol/L with ECG changes present urgent treatment is required. Use specific Hyperkalaemia prescription chart (see p6 if preprinted charts not available on ward) (See flowchart on next page if K+ is 6.0-6.4mmol/L and no ECG changes)

Monitor patient’s cardiac rhythm PLUS Recheck K+ (VBG) – but do not allow this to delay starting treatment

IV CALCIUM GLUCONATE 10% 10mL – Doctor to stay with patient during calcium administration
Is patient on digoxin?
No – Give calcium gluconate undiluted over 5 minutes.
Yes - give calcium gluconate more slowly, in 100mL glucose 5% over 20 minutes.

ACTRAPID® 10 units + 50mL GLUCOSE 50%
Give into a large vein over 30 minutes. See page 10 for more information and page 7 for “How to prepare” guide. Monitor BMs before and after infusion as per prescription chart (see page 6).

Also consider:
SALBUTAMOL 10mg NEBULISED (prescribe on main prescription chart)
Can have additive effect with insulin. Response may be reduced in patients on β-blockers or digoxin. Caution in patients with history of arrhythmias or IHD. See page 10 for more detail.
AND/or
SODIUM BICARBONATE 1.4% 500mL IV over 2 hours (prescribe on main prescription chart)
If pH<7.2 and only if advised by Renal Registrar/Consultant or Critical care. See page 10 for more detail.

Reduce Total Body Potassium (See page 11 for more detail)
■ Stop all potassium-containing/sparing drugs.
■ Ensure adequate hydration and monitor urine output.
■ Treat hypotension - give IV fluids if appropriate
■ Low potassium diet (see Appendix 1)
■ Consider diuretics if fluid overload
■ Consider calcium resonium®

Recheck K+ after 2 hours via VBG. Confirm using blood laboratory result.

K+ <6.0mmol/L
Repeat potassium and renal function again after 4-6 hours and then daily.

K+ 6.0 - 6.4mmol/L
Consider repeating insulin/glucose and other K+-lowering measures. Repeat potassium and renal function again after 4-6 hours and then daily. Seek expert advice if needed.

K+ ≥6.5mmol/L or develops renal failure or is oligo/anuric.
Contact Renal Registrar on-call urgently.
SUMMARY - INPATIENT Management of Moderate Acute Hyperkalaemia

If Potassium 6.0 - 6.4 mmol/L without ECG changes

REVERSE TOTAL BODY POTASSIUM (See page 11)

- Stop all potassium-containing/sparing drugs.
- Low potassium diet (see Appendix 1)
- Ensure adequate hydration and monitor urine output.
- Treat hypotension.
- Give IV fluids if dehydrated
- Monitor renal function.

See page 8 for clinical assessment and investigations

Consider steps to shift potassium e.g. insulin/glucose, salbutamol
(see flowchart on previous page) – seek senior advice e.g. from Medical Registrar if necessary

REMOVE EXCESS POTASSIUM
Calcium Resonium® 15g PO TDS. See page 11 for more information.
(This may not be necessary if the obvious cause for hyperkalaemia has been identified and corrected).
If oral route not available, calcium resonium® enemas can be used (please contact the pharmacist or on-call pharmacist for guidance for administration).

Recheck K⁺ after 4-6 hours then daily

Consider stopping calcium resonium® when K⁺ <6.0 mmol/L.
Stop treatment when K⁺ ≤ 5.5 mmol/L.
Continue with other supportive measures.

If patient does not respond to above measures, contact Renal Registrar on-call urgently to discuss further management.
**ADULT MANAGEMENT OF HYPERKALAEMIA**

**PRESCRIPTION CHART (Potassium ≥6.5mmol/L or ≥6.0mmol/L with ECG CHANGES)**

Please affix patient label

**DRUG ALLERGY or ADVERSE EFFECT**

If none known tick box

<table>
<thead>
<tr>
<th>Medicine/Other</th>
<th>Nature of reaction</th>
<th>Information source</th>
</tr>
</thead>
</table>

**Patient Name:**

**DOB:**

**NHS / K Number:**

**CONSULTANT**

Signature................................ Date..................

This section must be completed and signed by a prescriber or Pharmacist before a drug is administered.

**WARD**

This chart is only for use in treatment of Hyperkalaemia – use in conjunction with the Hyperkalaemia Management Guideline. See flowchart overleaf. Full guideline available on the intranet and app. Do NOT use insulin/glucose infusion in Diabetic Ketoacidosis – see DKA guideline.

**Potassium levels (mmol/L)**

<table>
<thead>
<tr>
<th>Initial Level</th>
<th>Re-check level (VBG or lab) immediately</th>
<th>2 hours post-treatment</th>
<th>4-6 hours post-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Date</td>
<td>Date</td>
<td>Date</td>
</tr>
<tr>
<td>Time</td>
<td>mmol/L</td>
<td>mmol/L</td>
<td>mmol/L</td>
</tr>
</tbody>
</table>

**12-Lead ECG**

<table>
<thead>
<tr>
<th>ECG changes?</th>
<th>Yes / No</th>
<th>If YES, state changes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Time</td>
<td>Date</td>
</tr>
</tbody>
</table>

**CALCIUM GLUCONATE PRESCRIPTION**

Doctor to stay with patient during administration.

Give UNDILUTED over 5 minutes. If patient on DIGOXIN give Calcium Gluconate in 100mL Glucose 5% over 20 minutes – prescribe on main prescription chart and annotate below to indicate this.

<table>
<thead>
<tr>
<th>Date</th>
<th>Route</th>
<th>Volume</th>
<th>Drug</th>
<th>Duration</th>
<th>Prescriber’s Signature, Name &amp; Bleep</th>
<th>Given by / Check</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV</td>
<td>10mL</td>
<td>10% Calcium Gluconate</td>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Repeat at 5 minute intervals if needed until ECG normal (max. 3 doses in total)

<table>
<thead>
<tr>
<th>Date</th>
<th>Route</th>
<th>Volume</th>
<th>Drug</th>
<th>Duration</th>
<th>Prescriber’s Signature, Name &amp; Bleep</th>
<th>Given by / Check</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV</td>
<td>10mL</td>
<td>10% Calcium Gluconate</td>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>10mL</td>
<td>10% Calcium Gluconate</td>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**INSULIN/GLUCOSE INFUSION PRESCRIPTION**

see “How To” guide for preparation

<table>
<thead>
<tr>
<th>Date</th>
<th>Route</th>
<th>Infusion Fluid and Vol (mL)</th>
<th>Additive</th>
<th>Duration</th>
<th>Prescriber’s signature, name &amp; Bleep</th>
<th>Batch Number</th>
<th>Prepared and given by / Check by</th>
<th>Start time</th>
<th>End Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV</td>
<td>50mL 50% Glucose</td>
<td>10 UNITS Actrapid</td>
<td>30 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Blood Glucose Monitoring – If &lt;4mmol/L treat as per NUH hypoglycaemia guideline</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Time after starting insulin/glucose infusion</th>
<th>Time taken</th>
<th>BG mmol/L</th>
<th>Taken by</th>
<th>Time interval post insulin/glucose infusion</th>
<th>Time taken</th>
<th>BG mmol/L</th>
<th>Taken by</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 minutes (baseline)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 minutes (end of infusion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Approved Oct 2018  Review Oct 2021  NUH04710S

Revised Oct 18 Due for Review Oct 2021 6
How to prepare 10 units of Actrapid® (soluble) insulin in 50mL of glucose 50% for the treatment of Hyperkalaemia

Give 10% calcium gluconate before insulin/glucose infusion

THIS IS ONLY FOR USE IN THE TREATMENT OF HYPERKALAEMIA – To be used in conjunction with the HYPERKALAEMIA MANAGEMENT GUIDELINE AND PRESCRIPTION CHART. Full guideline available on the intranet and app.

The whole process should have a two-person check

1. Obtain the following:
   a. 50mL glucose 50% glass bottle
   b. Human soluble (Actrapid®) insulin
   c. Insulin syringe
   d. Red blunt fill needle
   e. 50mL syringe

2. Measure 10 units of insulin using an insulin syringe
   a. Draw the plunger back to the 10 unit mark on the insulin syringe
   b. Two-person check by second practitioner.

3. Inject the 10 units of insulin into the 50mL Glucose 50% glass bottle and rotate the bottle slowly to mix.

4. Draw up the entire contents of the Glucose bottle into the 50ml syringe using a red blunt fill needle.

5. Fill in an intravenous infusion sticker and attach to the syringe.

6. Set up a syringe pump to administer the contents of the syringe over 30 minutes. Use DERS where available.

   The whole process should have a two-person check.

7. Ensure regular blood glucose monitoring is undertaken

   Blood Glucose Monitoring is essential – measure before and after starting infusion and then regularly for 6 hours as there is a risk of late hypoglycaemia. Record BMs on prescription chart. If <4mmol/L treat as per NUH hypoglycaemia guideline.
Detailed Guideline and Explanatory Notes

Causes of Hyperkalaemia

- Pseudohyperkalaemia
  - Test tube haemolysis - ensure samples arrive at the laboratory within 5 hours and NEVER refrigerate samples
  - EDTA contamination (from FBC sample tube)
  - Prolonged tourniquet time
  - Marked leucocytosis and thrombocytosis (measure whole blood potassium in green Lithium Heparin tube not serum concentration in these disease states)
  - Sample taken from drip arm
- Acute kidney injury
- Chronic kidney disease
- Drugs (potassium supplements, potassium-sparing diuretics such as amiloride, aldosterone antagonists such as spironolactone and eplerenone, ACE inhibitors, angiotensin II antagonists, NSAIDs, heparin, β-blockers, digoxin poisoning)
- Acidosis, including diabetic ketoacidosis (NB this guideline does not apply to the management of hyperkalaemia in DKA; see below and separate DKA guideline).
- Mineralocorticoid deficiency (e.g. Addison’s)
- Endogenous (tumour-lysis syndrome, rhabdomyolysis, trauma, burns)

Please note that this list is not comprehensive and that other causes may need to be considered.

Clinical Assessment

- Urine output – very important. If oliguric, medical treatment much less likely to work.
- Review potassium intake e.g. IV fluids, potassium supplements, diet.
- Review drugs: ACE inhibitors, Angiotensin II Antagonists, potassium-sparing diuretics (e.g. amiloride, spironolactone, eplerenone), potassium supplements, β-blockers (small effect).
- Review history for possible causes of renal disease or major tissue destruction.
- Review recent biochemistry results, in particular renal function and recent potassium levels.
- Fluid status – signs of dehydration or fluid overload.
- Potassium levels may be assessed on a venous blood sample using a point of care blood gas analyser in emergencies (results correlate well). This must be followed up with a formal laboratory measurement.

Investigations

- 12-lead ECG
- U&Es, venous bicarbonate, glucose, FBC
- If unwell, consider venous blood gases and lactate.
**Treatment of Hyperkalaemia**

- Exclude pseudohyperkalaemia.
- Stop all potassium supplements (IV and oral).
- Review patient’s medication for possible contributors to hyperkalaemia and or acute kidney injury.
- Reduce dietary $K^+$ intake.
- Ensure adequate hydration and urine output.
- If potassium $\geq 6.5$ mmol/l or ECG changes monitor patients cardiac rhythm until it is stable and potassium level is in range.

**Diabetic Ketoacidosis (DKA)**

Hyperkalaemia often occurs at presentation of diabetic ketoacidosis (DKA). In this situation, the patient is dehydrated and total body potassium is low. Hyperkalaemia resolves extremely rapidly and so the following guideline does not apply to the management of hyperkalaemia in DKA (see separate [DKA guideline](#)).

In the rare event that a patient with DKA has significant ECG changes with severe hyperkalaemia (potassium $>6.5$ mmol/L) then IV calcium gluconate should be given prior to starting fixed rate insulin infusion. In this instance **DO NOT** use insulin-glucose infusion.

After the above, there are three steps in managing hyperkalaemia.

If serum $K^+ < 6.5$ mmol/L and there are no ECG changes/symptoms of hyperkalaemia then omit Step 1 and 2 and move on to Step 3.

**Step 1:** Reduce cardiac cell membrane excitability

**CALCIUM GLUCONATE 10% 10 mL IV over 5 mins**

- The prescribing doctor must stay near the patient once the calcium has been prescribed, in order to monitor the patient, but a nurse may administer it if necessary.
- This does **not** lower the serum potassium but protects the cardiac membrane.
- ECG changes should improve within 1 to 3 minutes and its effect lasts for approximately 30 minutes.
- If necessary doses may be **repeated after 5 minutes up to maximum 3 doses**.
- If the patient is taking **digoxin**, the calcium gluconate should be given slowly (mixed with 100mL 5% glucose and given over 20 minutes) as rapid calcium administration may precipitate myocardial digoxin toxicity.
- 10mL calcium chloride 10% can be used as an alternative to calcium gluconate but only one dose is required. It is more irritant than calcium gluconate when given peripherally.
- Never give at the same time as sodium bicarbonate or insulin/glucose infusion via the same access site due to the risk of precipitation.
**Step 2:  Shift potassium from extracellular to intracellular space**

Shifting potassium intracellularly is a useful holding measure in life-threatening hyperkalaemia. However, it does **not** reduce total body potassium, and after two to six hours, there is an efflux of potassium back out into the extracellular space resulting in serum levels as high or sometimes even higher than at the outset. Therefore, any of the steps in section 2 must be combined with those in section 3, and serum potassium must be regularly rechecked.

It is not satisfactory to perform any of the management steps in Step 2 without regular ongoing assessments of the patient.

If the patient has renal failure (particularly if they are oligo/anuric) then urgent dialysis may be required. Contact the Renal Registrar/Consultant on-call urgently. If haemodialysis is planned for within 15-30 minutes then treatments to move potassium into cells are unlikely to be helpful and may make potassium removal on dialysis more difficult.

**INSULIN ACTRAPER®** 10 units in 50 mL of Glucose 50% IV over 30 minutes via syringe pump

- Always give into a large vein as irritant.
- Reduces serum K⁺ by 0.65 - 1.0mmol/L.
- Monitor blood glucose before and after infusion, every 15-30 minutes and hourly for up to 6 hours as there is a risk of late hypoglycaemia (see prescription chart for details).

Then consider:

**SALBUTAMOL** 10mg nebulised

- Can be given for an additive effect to insulin/glucose.
- Reduces serum K⁺ by 0.53 - 0.88mmol/L **but response has been shown to be inconsistent** – this step **is optional and must not be used as single agent**.
- Caution in patients with ischaemic heart disease and history of cardiac arrhythmias (avoid/use lower dose).
- Response reduced in patients on β-blockers and digoxin.

**SODIUM BICARBONATE 1.4% 500 mL IV over 2 hours – ONLY CONSIDER IF pH < 7.2 and on advice of Renal registrar or Critical Care.**

- The use of sodium bicarbonate is controversial in patients with acidosis. There is insufficient evidence to justify routine use and use of sodium bicarbonate is associated with significant risk of sodium and fluid overload (e.g. pulmonary oedema). It should therefore **only be used after discussion with a Renal Registrar/Consultant or Critical Care**.
- Risk of tetany in patients with chronic renal failure and underlying hypocalcaemia.
- Never give at the same time as IV calcium via the same access site (risk of precipitation).

After any of the above steps: Recheck potassium 2 hours, and 4-6 hours (risk of rebound hyperkalaemia), after treatment. Check kidney function at 4-6 hours post-treatment and then daily.

- If K⁺ remains ≥6.5mmol/L or ECG changes persist, contact on call Renal Registrar/Consultant urgently.
- If potassium has improved but the patient is oligo/anuric or developing acute kidney injury contact the Renal Registrar/Consultant on-call urgently as the potassium will almost certainly rebound.
**Step 3: Reduce total body potassium**

3a) **REDUCE POTASSIUM INTAKE**
- Low potassium diet (consider dietetic review and order appropriate diet, remember food from home). See Appendix 1 (print out pages 14 and 15 for patient information)
- Avoid drugs which raise potassium.

3b) **PROMOTE URINARY POTASSIUM LOSS**
- Monitor fluid balance and encourage good urine output by ensuring adequate hydration with oral or IV fluids. Normal saline 0.9% is preferable as long as the patient is not significantly overloaded. Avoid fluids containing potassium e.g. Hartmann’s.
- Treat hypotension – remember to review the drug chart e.g. antihypertensives.
- If well hydrated, consider starting or increasing the dose of a loop diuretic.

3c) **REMOVE EXCESS POTASSIUM**
- Calcium Resonium® has a slow onset of action (at least 2-6 hours) – interim measures as above required.
- Prescribe Calcium Resonium® 15g PO TDS.
- Removes K⁺ from gut by ion exchange thus lowers total potassium load.
- Each gram of Calcium Resonium® removes approximately 1mmol potassium from the gut.
- **Caution:** contraindicated in patients with pre-existing hypercalcaemia; SPC advises avoid other oral medications for 3 hours before and after administration.
- May cause constipation – co-prescribe Senna 2 tablets twice daily.
- May not be necessary if the obvious cause of hyperkalaemia has been identified and corrected.
- Oral Calcium Resonium® is unpalatable and poorly tolerated.
- Monitor U&Es daily and consider stopping when K⁺<6.0mmol/L. Once K⁺≤5.5mmol/L discontinue treatment.
- If oral route not available consider Calcium Resonium® enema 30g per rectum (PR) daily; however this is poorly tolerated by patients (please contact pharmacist or on call pharmacist for guidance on administration).

3d) **DIALYSIS**
If the patient does not respond to the above measures dialysis will be required.
**DIALYSIS IS LIKELY TO BE NEEDED IF POTASSIUM VERY HIGH, PATIENT IS Oligo/Anuric, PATIENT IS ALREADY ON LONGTERM DIALYSIS OR HAS ADVANCED CKD.** In these situations contact the Renal Registrar/Consultant on-call urgently to discuss management.
Notes on treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mechanism of Action</th>
<th>Time to Onset of Action</th>
<th>Duration of Action</th>
<th>Achievable reduction of serum $K^+$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Calcium Resonium®</strong></td>
<td>Ion-exchange resin that exchanges sodium for potassium as it passes through intestine</td>
<td>2-6 hours or longer</td>
<td>4-6 hours</td>
<td>unknown</td>
</tr>
<tr>
<td><strong>Calcium gluconate</strong></td>
<td>Antagonises cardiac membrane excitability</td>
<td>1-3 minutes</td>
<td>30-60 minutes</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Insulin Actrapid® with glucose</strong></td>
<td>Increased intracellular uptake of $K^+$ via Na-K ATP pump</td>
<td>Within 15 minutes, peak effect 30-60 minutes</td>
<td>2-6 hours</td>
<td>0.65-1mmol/L</td>
</tr>
<tr>
<td><strong>Nebulised salbutamol</strong></td>
<td>Increased intracellular uptake of $K^+$ via Na-K ATP pump; response reduced by β blockers and digoxin</td>
<td>Variable effect, acts within 30 minutes, maximum effect at 60 minutes</td>
<td>1-3 hours</td>
<td>0.53-0.88mmol/L</td>
</tr>
<tr>
<td><strong>Sodium bicarbonate</strong></td>
<td>Corrects acidosis and thus promotes intracellular uptake of $K^+$</td>
<td>After 60 minutes, effect variable</td>
<td>unknown</td>
<td>unknown</td>
</tr>
</tbody>
</table>

References:
Appendix 1 - Low potassium diet

For every inpatient that requires a low potassium diet, please ensure that you:

1. Liaise with the hospital kitchen/ward waitress and arrange a low potassium/renal diet by ringing:
   - City Campus: extension 59099
   - QMC Campus: extension 63221

2. Refer the patient to your ward dietitian using Nervecentre or contacting the Department of Dietetics and Nutrition:
   - City Campus: extension 57139
   - QMC Campus: extension 63179

3. Inform patient and/or relative about suitable options (see next page)

A dietitian will assess each patient individually and will provide appropriate dietetic advice based on the patient’s current potassium intake and clinical conditions. Dietitians are trained to advise on a low potassium diet as well as ensuring that the patient’s diet is well balanced. Many inpatients with acute kidney injury may require a low potassium diet only temporarily. Following a low potassium diet if not needed will inevitably lead to water soluble vitamin and micronutrient deficiency.

This appendix should only be used during weekends or bank holidays. Inpatients should still be referred to the Department of Dietetics and Nutrition as the dietitians will provide appropriate dietetic advice and follow up.
Why do you need to follow a low potassium diet while you are in hospital?

Potassium is a mineral found in many foods and drinks. The potassium in your blood is needed for your muscles and heart to work properly. The amount of potassium in your blood is normally controlled by your kidneys. If your kidneys are not working properly they may not remove enough potassium leading to a build-up of potassium in the blood. Too much potassium in your blood can be dangerous as it can cause an irregular heart rhythm.

In order to keep the level of potassium in your blood safe you need to reduce the amount of potassium in your diet. **You should only follow a low potassium diet if you have been advised by your health care professional to do so.**

This leaflet gives you some initial advice to help you reduce the amount of potassium in your diet while you are in hospital. If you need to follow low potassium diet you should be referred to a registered dietitian who will give you personalised dietary advice and ensure that your diet remains well balanced.

**Controlling your potassium level**

Potassium is found in many foods and drinks including fruits, vegetables, potatoes, milk and some snacks. You do not necessarily have to avoid all high potassium foods, it may be sufficient to just reduce your intake of these foods and consume them in moderation. Ask your dietitian for more advice. Please show visitors this list so that they can bring in suitable snacks for you.

<table>
<thead>
<tr>
<th>Food group</th>
<th>High potassium foods to limit:</th>
<th>Lower potassium choices:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>Bananas, avocado, currants (black, red or white), dried fruit (raisins, sultanas, dates, dried apricots).</td>
<td>Apple, pear, satsuma, clementine, 10 grapes, tinned fruit.</td>
</tr>
<tr>
<td>Starchy Foods</td>
<td>Jacket or baked potatoes; oven, microwave or retail chips; manufactured potato products such as hash browns, potato waffles, frozen roast potatoes or potato wedges.</td>
<td>Boiled potatoes or potatoes which have been par-boiled before roasting or frying. Pasta, rice, noodles, couscous, and breads – these are all much lower in potassium than potato.</td>
</tr>
<tr>
<td></td>
<td>Fried cassava, yam or sweet potato. Taro, plantain and parsnip.</td>
<td>Boiled cassava, yam or sweet potato.</td>
</tr>
<tr>
<td></td>
<td>Breakfast cereals containing lots of dried fruit, nuts or chocolate for example, muesli, granola, fruit and fibre</td>
<td>Suitable breakfast cereals include rice or corn based cereals, wheat biscuits, Shredded wheat®, Special K® and porridge oats.</td>
</tr>
<tr>
<td><strong>Snacks</strong></td>
<td>Potato crisps, chocolate, fudge, nuts. Biscuits and cakes containing lots of dried fruit, nuts or chocolate.</td>
<td>Corn, rice, wheat or maize based snacks, popcorn, boiled or jelly sweets, marshmallows, mints. Plain biscuits and cakes such as rich tea, digestives, shortbread, custard creams, sponge cake, madeira cake, angel cake.</td>
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<tr>
<td><strong>Drinks</strong></td>
<td>Coffee (limit to 1 cup a day), malted milk drinks for example Ovaltine® or Horlicks®, hot chocolate, fruit and vegetable juices, smoothies.</td>
<td>Tea, herbal tea, squash or cordial, water, fizzy drinks</td>
</tr>
<tr>
<td><strong>Milk and Dairy Products</strong></td>
<td>Limit milk to ½ pint per day (300ml). Limit yogurt to 3 small pots per week. Condensed milk, evaporated milk and milk powders</td>
<td>Limit milk to ½ pint per day (300ml). Cheese, crème fraiche or cream. Rice or oat milk.</td>
</tr>
<tr>
<td><strong>Salt Substitutes</strong></td>
<td>Lo-Salt, So-Low, reduced sodium salt.</td>
<td>Pepper, fresh or dried herbs, spices, chilli, garlic.</td>
</tr>
</tbody>
</table>

Please discuss with your dietitian if you have diabetes and/or if you have been advised to follow this long term.

*(The information above has been adapted from the “First Line Potassium Lowering Dietary Advice” diet sheet developed by the Renal Nutrition Group of the British Dietetic Association 2018)*