

## 1. Introduction and Who Guideline applies to

Hyperkalaemia is defined as a serum potassium ( $K^+$ ) concentration of  $> 5.5\text{mmol/L}$ . Even lesser elevations increase all-cause mortality: Patients with  $K^+$  5.1 - 5.5 have twice the risk of dying in hospital than those with  $K^+$  3.5 - 5.0. [1]

Raised  $K^+$  is seen in up to 10% of hospitalised adults. Those with CKD are at particular risk, with the incidence of hyperkalaemia rising from 2 to 42% as GFR falls from 60 to 20  $\text{mL min}^{-1}$ . [2]

This document provides practical guidance on managing acute hyperkalaemia based on the 2023 UK Kidney Association guideline [3] and the 2019 NICE technology assessment of sodium zirconium cyclosilicate (SZC). [4] It applies to all adult inpatients, and covers clinical staff working within, the Emergency and Specialist Medicine (ESM) Clinical Management Group (CMG) but may also be used in other CMGs where adult inpatients with acute hyperkalaemia are managed.

Caveats:

- Information about pseudohyperkalaemia and its avoidable causes is kept intentionally brief, as in-depth discussion is readily accessible elsewhere. [5]
- The guideline does not apply to managing hyperkalaemia in diabetic ketoacidosis (DKA).
- An aggressive diuretic regimen combining a loop diuretic, a thiazide, and acetazolamide - the 'nephron bomb' described in the Internet Book of Critical Care (IBCC) - can markedly increase urinary  $K^+$  excretion. Provided the patient is not hypotensive, hypovolaemic, or anuric, it may help avoid dialysis when routine treatments including a loop diuretic alone have failed. The technique requires some expertise and is therefore not included in our treatment algorithm.

## 2. Guideline Standards and Procedures

- 2.1 Patients should initially be managed according to [Appendix A](#) and [Appendix B](#), also available as a single double-sided proforma from the 'ED on-demand print kiosk'.
- 2.2 'Shifting treatments'—namely nebulised salbutamol and IV insulin-glucose infusion (with IV sodium bicarbonate where indicated)—often need repeating to reduce  $K^+$  to  $<6.0\text{ mmol/L}$ .
- 2.3 Repeated shifting treatments increase the risk of hypoglycaemia. If capillary blood glucose (CBG) is  $<7\text{ mmol/L}$  before a new round, give an additional 25g glucose (250 mL of 10% IV over 5 hours).
- 2.4 Shifting treatments lower serum  $K^+$  only temporarily. Levels typically rebound within 2–6h unless  $K^+$  is removed from the body via diuresis (responding to fluid resuscitation or loop diuretics),  $K^+$  binders or, ultimately, renal replacement therapy (RRT).
- 2.5 For patients on regular dialysis, arrange Renal Unit transfer as soon as stable. Emergency haemofiltration in critical care is a suboptimal alternative and should be avoided.
- 2.6 Criteria for safe inter-hospital transfer to the Renal Unit are outlined in [Appendix A](#), Box 4.
- 2.7 In patients not on dialysis, repeated shifting treatments combined with a  $K^+$  binder (sodium zirconium cyclosilicate) often avoid the need for emergency RRT.
- 2.8 Cation-exchange resins (e.g. calcium resonium) should no longer be routinely used for acute hyperkalaemia in hospital. [3]
- 2.9 Medications—especially RAAS inhibitors, NSAIDs, and trimethoprim—commonly contribute to hyperkalaemia. A thorough medicines review ([Appendix C](#)) is therefore essential to reduce recurrence.
- 2.10 This applies also to patients with mild hyperkalaemia not requiring emergency treatment, as even they face an elevated mortality risk.
- 2.11 In patients with diabetes, kidney, or cardiovascular disease at high risk of AKI who are able to self-manage, consider providing 'sick day' guidance on temporary cessation of certain medications (RAASi, diuretics, metformin, NSAIDs and SGLT2i) during acute dehydrating illness (e.g. diarrhoea, vomiting). For an example, see the patient leaflet produced by the London Kidney Network. [7]
- 2.12 Recommended interventions to prevent hyperkalaemia are listed in [Appendix D](#).

### 3. Education and Training

No additional skills are required to follow this guideline.

### 4. Monitoring Compliance

What will be measured to monitor compliance	Compliance monitoring	Monitoring Lead	Frequency	Reporting arrangements
Proportion of haemodialysis pts presenting to ED with $K^+ \geq 6.0$ who have CVVH in ICU rather than dialysis at the renal unit	Audit	Richard Baines	Once every three years	ESM Q&S board
Appropriate SZC prescribing practice	Audit	Rishi Gupta	Once every three years	ESM Q&S board

### 5. Supporting References

1. Singer A, Thode HC and Peacock WF. [A retrospective study of emergency department potassium disturbances: severity, treatment, and outcomes](#). Clin Exp Emerg Med 2017;4:73–79. Accessed 10Feb25.
2. LottC, TruhlářA, AlfonzoA et al. [European Resuscitation Council Guidelines 2021: Cardiac arrest in special circumstances](#). Resuscitation. 2021;161:152-219. Accessed 10Feb25.
3. AlfonzoA, HarrisonA, BainesR et al. [Clinical Practice Guidelines - Treatment of Acute Hyperkalaemia in Adults](#). UK Kidney Association Oct 2023. Accessed 10Feb25.
4. NICE (2019) Sodium zirconium cyclosilicate for treating hyperkalaemia. [TA599](#). London: National Institute for Health and Care Excellence. Accessed 10Feb25.
5. Wills MR. Pseudohyperkalemia [Internet]. Lyngby, Denmark: Radiometer Medical ApS; [date unknown]. Available from: <https://acutecaretesting.org/en/articles/pseudohyperkalemia>.
6. Weingart SD. IBCC chapter & cast – Hyperkalemia [Internet]. EMCrit Project. Available from: <https://emcrit.org/ibcc/hyperkalemia/> Accessed 18May25.
7. London Kidney Network. Sick day rules: guidance for people with kidney disease [Internet]. London: NHS London Kidney Network; 2024. Available from: <https://londonkidneynetwork.nhs.uk/wp-content/uploads/2025/01/LKN-Sick-Day-RulesDec24-final-v2.2.pdf> Accessed 10Feb25.

### 6. Key Words

Hyperkalaemia, potassium, pseudohyperkalaemia, emergency, treatment, bicarbonate, sodium zirconium cyclosilicate, SZC, glucose, insulin, salbutamol, renal, failure, acute kidney injury, dialysis, haemofiltration, AKI, ITU, ICU, intensive care, ECG, electrocardiogram, resuscitation, cardiac arrest, CPR, mortality, death

CONTACT AND REVIEW DETAILS	
<b>Guideline Lead (Name and Title)</b> Martin Wiese, Emergency Physician	<b>Executive Lead</b> Andrew Furlong, Medical Director
<b>Details of Changes made during review:</b> <ul style="list-style-type: none"><li>• Extensive formatting changes – including presentation of the initial management guidance as a proforma</li><li>• Content adjusted to changes in UK guidance, fully compliant with UKKA 2023 guideline</li><li>• Cation-exchange resins (e.g. calcium resonium) removed from in-hospital hyperkalaemia care</li><li>• References to Nervecentre hyperkalaemia order sets and dose sentences made throughout</li><li>• Explicit information regarding repeated rounds of 'shifting treatments' added</li><li>• Detailed information regarding options for fluid resuscitation added</li><li>• Safety criteria for transfer to the Renal Unit added</li><li>• Information about causes (including medicines) and interventions to help prevent recurrence added</li></ul>	

Emergency and Specialist Medicine

**Acute hyperkalaemia in adults**

Use in the ED and inpatients areas for patients with K<sup>+</sup> 5.5 or above

DO NOT use in

- Diabetic ketoacidosis; follow DKA guideline (B66/2011)
- Dialysis patients with elevated K<sup>+</sup> levels but NO hyperkalaemic ECG changes immediately prior to a dialysis session
- Pts sent to ED from primary care (use guideline C41/2020 instead)

Disclaimer:  
This is a clinical template; clinicians should always use judgment when managing individual patients

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Review due: Nov 2030 - Trust Ref: B28/2015

Patient details

Full name

DoB

Unit number

(use sticker if available)

① Hyperkalaemic ECG changes?

Yes - one or more of the below

Peaked T waves  
(narrow base, high amplitude, sharp pointy apex and usually symmetrical)

Absent or flattened P waves

Wide QRS (>0.12sec)

Ventricular tachycardia (VT)

Merging S and T ('sine') waves

Bradycardia (sinus / AV block)

Pseudo-STEMI

Brugada phenocopy

No - none of the above

② Shifting treatments

administer both at the same time

**Salbutamol nebulised solution**  
Usual dose is 20mg (5mg x4 back-to-back)  
Reduce to 10mg (5mg x2 back-to-back) if coronary artery disease, tachyarrhythmia or open angle glaucoma

**Insulin-glucose IV infusion**  
Add Actrapid 10units to 50% glucose 50mL (=25G), add mix to 100mL of 0.9% sodium chloride and infuse over 15min via pump

**NB:** These treatments are only temporising. K<sup>+</sup> level will rise again within 2-6h unless K<sup>+</sup> is removed from the body by diuresis (in response to fluid resuscitation or loop diuretics), K<sup>+</sup> binders or, if those efforts are ineffective, haemodialysis or haemofiltration.

③ Removing K<sup>+</sup> from body

**Sodium zirconium cyclosilicate (SZC)**  
Prescribe SZC (brand name Lokelma) 10G in 45mL of water TDS for three days (but stop once K<sup>+</sup> is 5.0 or less; usually after 24-48h)

Powder will not dissolve. Stir just before giving cup to patient; the liquid should be taken while still cloudy.

If patient is taking 'azole' antifungals, anti-HIV medicines or tyrosine kinase inhibitors, administer SZC two hours before or after to avoid reducing pH-dependent bioavailability

Hypokalaemia, gastro-intestinal issues and oedema are potential risks

SZC may be radiopaque; state 'patient is taking sodium zirconium cyclosilicate' in request if abdominal imaging is needed

④ Is renal unit transfer safe?

Yes - as ALL of the below

Hyperkalaemic ECG changes resolved

K < 6.5

pH > 7.2

Bicarb > 12

Lactate < 4

Resp rate < 25

SpO<sub>2</sub> in range

FiO<sub>2</sub> 35% or less

MAP > 65

Heart rate < 131

GCS > 12

No - as not all of the above

**NB:** Renal consultant may agree to waive some of the above on a case-by-case basis

⑤ Hyperkalaemia causes

tick any that might apply in your patient

Medicines  
(go to Appendix C for a comprehensive list)

Continuing (not pausing) the medicines below during acute dehydrating illness 'sick days'  
RAASI (i.e. ACE inhibitors, ARBs, MRAs), diuretics, metformin, NSAIDs or SGLT2i

Renal impairment (AKI / CKD / CCF / diabetes)

CKD worsened by constipation, acidosis, poor diabetic control or taking trimethoprim

Urinary tract obstruction

Adrenal insufficiency (Addison's, Type 4 RTA)

Massive tissue injury (e.g. crush injury, rhabdomyolysis or severe burns)

Tumour lysis syndrome

Sickle cell disease

Haemolysis

Transfusion - especially if massive, using a pressure device or older / irradiated RBCs; young children are at particular risk

Treat as per ALS algorithm AND Prescribe order set

K<sup>+</sup> > 6.4 in cardiac arrest

Calcium chloride 10% 10mL  
PFS (pre-filled syringe) IV STAT

Flush with 0.9% sodium chloride 20mL

Sodium bicarbonate 8.4% 50mL IV STAT

Actrapid 10units added to a vial of Glucose 50% 50mL IV STAT

Repeat calcium after 5min if refractory arrest (from order set Add-on treatments)

If blood glucose < 7 before treatment, add glucose 10% 500mL (25G) over 5h (also from order set Add-on treatments)

Consider ECPR where feasible

Consider haemofiltration or dialysis if no ROSC after 15min, and also if ROSC achieved

Cardiac arrest with K<sup>+</sup> ≥ 6.5?

Y

N

Rapidly repeat sample using lithium-heparin (orange top) tube (if K<sup>+</sup> 6.0 or higher: URGENT VBG)

**NB:** If initial K<sup>+</sup> 6.0 or higher AND ECG hyperkalaemic (see box 1), consider prescribing order set

K<sup>+</sup> > 6.4 OR ECG changes while awaiting repeat result

Repeat-K<sup>+</sup> < 5.5?

Y

N

Repeat-K<sup>+</sup> > 5.9?

Y

N

Move patient to a suitable environment (e.g. in ED: Resuscitation room - ER)

Involve senior (middle grade or above)

Perform an ABCDE assessment

Ensure reliable and secure IV access

Attach an ECG monitor

Obtain 12-lead ECG

Record fluid balance hourly

Document NEWS2 at least half-hourly while K<sup>+</sup> > 5.9

K<sup>+</sup> > 6.4 and/or ECG hyperkalaemic (see box 1)?

Y

N

Prescribe order set: K<sup>+</sup> > 6.4 OR ECG changes (if not already) to

Protect the heart by giving 6.8mmol of calcium salts IV

Preferred: Calcium gluconate 10% 30mL over 10min

OR Calcium chloride pre-filled syringe 10% 10mL over 5min

Repeat 12-lead ECG

Shift K<sup>+</sup> into cells (see box 2 for details)

Remove K<sup>+</sup> from body (see box 3 for details)

If ECG still hyperkalaemic after 5min, repeat calcium salt IV (prescribe from order set Add-on treatments)

Glucose (CBG) < 7 BEFORE treatment?

Y

N

Prescribe glucose 10% 250mL (=25G) over 5h from order set Add-on treatments

See box 6 on next page for fluid management, further treatments and disposition

Mild hyperkalaemia

STOP any started treatment

Identify and manage causes (see box 5 and Appendix C), and prevent recurrence as per Appendix D

Recheck K<sup>+</sup> within 24h - 72h depending on predicted risk and rate of further K<sup>+</sup> rise

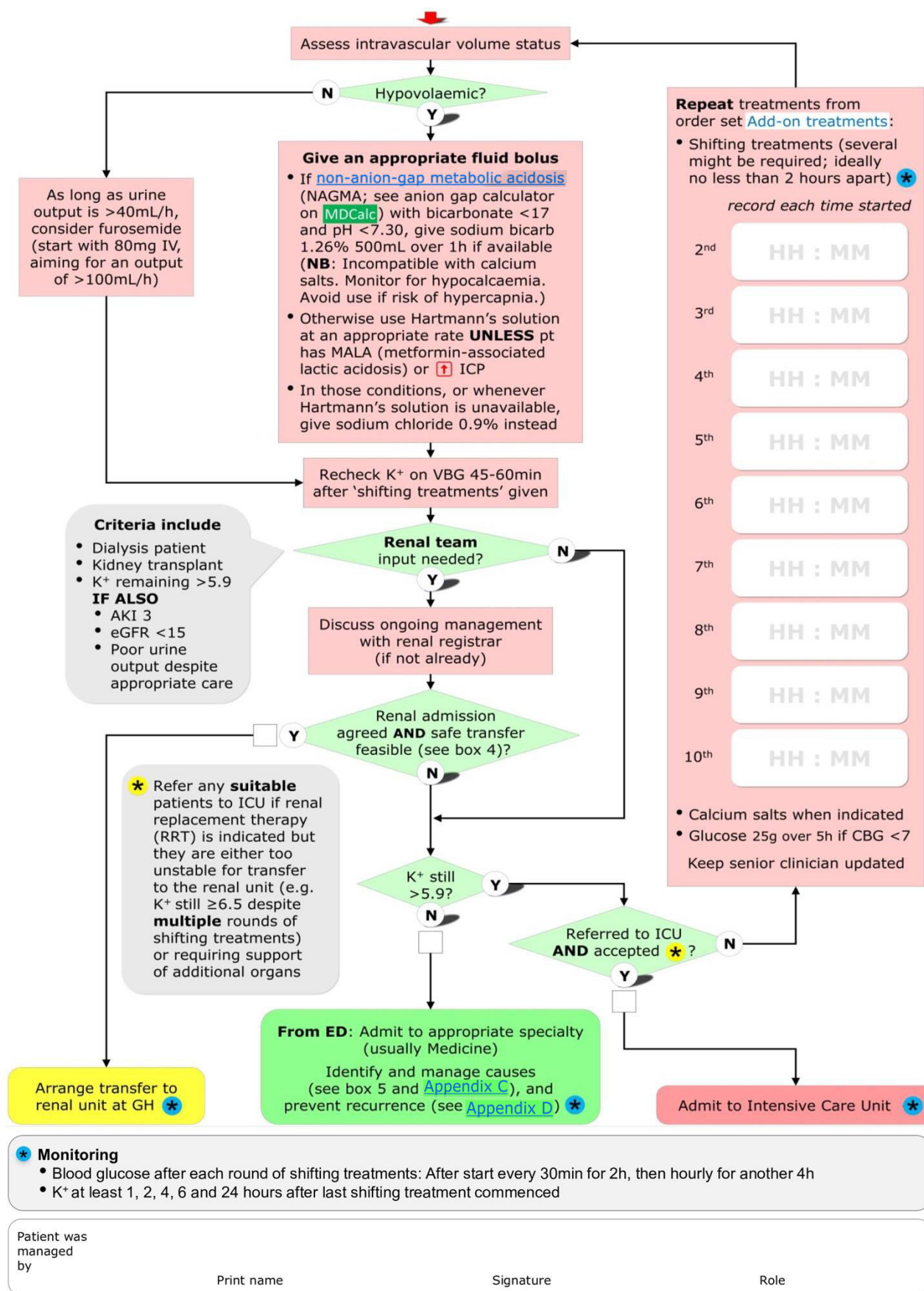
Print name

Signature

Role



## ⑥ Emergency hyperkalaemia treatment continued



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## Appendix C. Medicines that can cause raised K<sup>+</sup> and suggested prescribing strategy.

- Commonly implicated medicines are highlighted in **BLUE**
- Consider printing this page for your patient's records (ticking the relevant medicines)

### Drugs that affect aldosterone secretion / related effects

- ☐ **ACE inhibitors**  
(inhibit conversion of Angiotensin I to Angiotensin II)
- ☐ **Angiotensin receptor blockers (ARBs)**  
(inhibit activation of Angiotensin IR by Angiotensin II)
- ☐ **NSAIDs and COX-2 inhibitors**  
(inhibit renin release)
- ☐ Renin inhibitors (e.g. aliskiren)
- ☐ Calcineurin inhibitors (e.g. ciclosporin or tacrolimus)  
(also inhibit Na<sup>+</sup>/K<sup>+</sup>-ATPase necessary for K<sup>+</sup> secretion)
- ☐ Heparins including LMWH (reduce aldosterone production)
- ☐ Antifungals (e.g. ketoconazole, fluconazole and itraconazole)  
(suppress aldosterone synthesis)

### Drugs that block aldosterone binding to mineralocorticoid receptor (MRA)

- ☐ **Spironolactone**, eplerenone
- ☐ Finerenone (a non-steroidal MRA)

### Drugs that inhibit activity of epithelial sodium channel

- ☐ **Potassium sparing diuretics** (e.g. amiloride and triamterene)
- ☐ **Trimethoprim and co-trimoxazole**
- ☐ Pentamidine

### Drugs that alter transmembrane potassium movement

- ☐ **Beta blockers** (atenolol, metoprolol, propranolol)
- ☐ Digoxin **at toxic levels** (inhibits Na<sup>+</sup>/K<sup>+</sup>-ATPase)
- ☐ Intravenous cationic amino acids
- ☐ Hyperosmolar solutions (e.g. mannitol or high-strength glucose)
- ☐ Suxamethonium, especially in burns, major trauma and infection
- ☐ Octreotide (suppresses insulin secretion)
- ☐ Metformin (through MALA; metformin-associated lactic acidosis)

### Potassium containing agents

- ☐ **K<sup>+</sup> supplements** (e.g. Sando-K<sup>®</sup> and Kay-Cee L Liquid<sup>®</sup>)
- ☐ Salt substitutes (e.g. LoSalt)
- ☐ Herbal remedies  
(e.g. alfalfa, dandelion, horsetail, milkweed and nettle)
- ☐ Laxatives (e.g. Movicol<sup>®</sup>, Laxido<sup>®</sup>, Klean-Prep<sup>®</sup> and Fybogel<sup>®</sup>)

### Suggested prescribing strategy

- Medicines listed under **sick day guidance** above should be **PAUSED**, with a plan to **RESTART** them when recovered. For more info see 'Think Kidneys' [guidance](#).
- **STOP** any other implicated medicines if it is safe to do so, or **REPLACE** them with suitable alternatives if indications remain
- Seek advice from renal team if a medicine can be neither be stopped nor replaced

## Appendix D. Hyperkalaemia prevention.

	Primary ... to avoid an initial episode of hyperkalaemia	Secondary ... to avoid recurrence
Non-dialysis patients	<p><b>Regular blood monitoring for patients at risk</b> e.g. those with CKD, heart failure or diabetes as well as any patients taking RAASi medications</p> <p><b>Address modifiable factors</b></p> <ul style="list-style-type: none"> <li>Avoid drug combinations that potentiate hyperkalaemia (e.g. trimethoprim in a patient taking an ACE inhibitor)</li> <li>Correct acidosis (using a cause-specific approach)</li> <li>Avoid and treat constipation</li> <li>Optimise diabetic control</li> <li>Dietary modifications where indicated: Seek specialist dietary advice for those with CKD 4 - 5</li> </ul> <p><b>Anticipate risk of hyperkalaemia in acute illness</b></p> <ul style="list-style-type: none"> <li>Consider who is at risk at time of hospital admission</li> <li>Consider need to withhold drugs that potentiate hyperkalaemia during admission</li> <li><b>Sick day guidance:</b> Advise those with diabetes, kidney or cardiovascular disease to pause <b>RAASi medications (i.e. ACEi, ARBs and MRAs), diuretics, metformin, SGLT2i, NSAID and COX-2 inhibitors</b> during any acute dehydrating illness (e.g. D&amp;V) until recovered</li> </ul>	<p><b>Same as for primary prevention AND</b></p> <ul style="list-style-type: none"> <li>If a K<sup>+</sup>-binder is given during this admission, monitor for recurrence of hyperkalaemia when binder is discontinued</li> <li>If patient has no heart failure and no CKD 3b – 5, <b>STOP</b> RAASi drugs</li> <li>For patients with persistent K<sup>+</sup> ≥ 6.0 and heart failure or CKD 3b – 5 who benefit from RAASi medications, consider a K<sup>+</sup>-binder (SZC or patiomer). This may allow patient to <b>RESTART</b> RAASi medications at optimal doses after recovery and thus help avoid adverse clinical outcomes.</li> <li>Consider diuretic in those with heart failure or CKD, particularly if volume overloaded</li> <li><b>Sick day guidance:</b> Check that the patient fully understands the advice given to them</li> </ul>
Dialysis patients	<p><b>Regular blood monitoring</b></p> <p><b>Address modifiable factors</b></p> <ul style="list-style-type: none"> <li>Avoid prolonged fasting. If nil oral intake, consider a 10% glucose infusion at 42mL/h (= 100G in 24h) unless diabetic. If diabetic, use a VR111 with substrate instead.</li> <li>Avoid and treat constipation</li> <li>Optimise diabetic control</li> <li>Dietary modifications (seek specialist dietician input)</li> </ul> <p><b>Address dialysis-related factors</b></p> <ul style="list-style-type: none"> <li>Maintain good dialysis access</li> <li>Optimise adequacy</li> <li>Minimise re-circulation</li> </ul> <p><b>K<sup>+</sup>-binders</b> Consider as bridge if dialysis delayed (e.g. access issues)</p>	<p><b>Same as for primary prevention AND</b></p> <ul style="list-style-type: none"> <li>Increase frequency of blood monitoring (vigilance if high likelihood of recurrence)</li> <li>K<sup>+</sup>-binders – potential role for chronic hyperkalaemia if other strategies fail</li> </ul>