Potassium: hyperkalaemia: GEMS

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Please follow the link for a PDF version of the GEMS for download/printing:
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Hyperkalaemia 1: abnormal result

BMJ 2015;351:h4762, Clinical Practice Guidelines: treatment of acute hyperkalaemia in adults, UK kidney association 2023, Think kidneys: changes in kidney function and serum potassium during ACEi/ARB/diuretic treatment in primary care, October 2017, Derbyshire shared care pathology hyperkalaemia guideline, accessed 2020

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Hyperkalaemia management depends on degree of hyperkalaemia, symptoms and ECG changes

Mild hyperkalaemia **5.5–5.9mmol/l**

Moderate hyperkalaemia **6–6.4mmol/l**

Severe hyperkalaemia **≥6.5mmol/l**

Admit if acutely unwell or AKI

ECG for ALL with moderate hyperkalaemia
Admit if ANY of the following:
bradycardia, diminished P waves, prolonged PR interval, wide QRS complexes or peaked T waves

Admit if ANY symptoms of hyperkalaemia:
muscle weakness, paraesthesia, arrhythmia or syncope

Admit
for inpatient treatment and cardiac monitoring
(if ECG changes are present, there is a risk of decompensation to VT, VF or cardiac arrest)

Manage in primary care if:
asymptomatic AND well AND no acute kidney injury AND either mild OR moderate hyperkalaemia with a normal ECG

Mild hyperkalaemia **5.5–5.9mmol/l**

Moderate hyperkalaemia **6–6.4mmol/l with NORMAL ECG**

Repeat U&Es: when?

Repeat U&Es within 3 days

Repeat U&Es within 1 day

AND

Review the PATIENT and their MEDICATIONS (see list of causes of hyperkalaemia on p2)
Reduce/stop causative drugs

AND

If on ACEi/ARB/MRA...

HALVE the dose of one/both
Repeat U&Es within 1w
Review ongoing use of ACEi/ARB/MRA (see p2)

CKD 3b or worse BUT not on dialysis, OR heart failure

Yes **No**

If persistent moderate hyperkalaemia AND suboptimal (or absent) ACEi/ARB/MRA therapy

Secondary care may consider patiromer or sodium zirconium cyclosilicate alongside ACEi/ARB/MRA therapy

If secondary care medication (box above) not suitable OR if it cannot be accessed promptly

STOP ACEi/ARB/MRA medication/s
Repeat U&Es within 1w and review their ongoing use (see p2)

Minimal evidence for low-potassium diet in those without CKD (see below for information about diet and CKD)
If ongoing chronic hyperkalaemia: calcium resonium may be used short term; monitor U&Es
Consider a loop diuretic if passing urine, not dehydrated and renal function preserved; monitor U&Es
(consider advice from secondary care if unsure)

CKD and hyperkalaemia

CKD and hyperkalaemia ≥5.5mmol/L:

- Assess for non-dietary causes, e.g. constipation, poorly-controlled diabetes.
  - Constipation reduces gut excretion of potassium (important in CKD because renal excretion is less efficient).
- If non-dietary causes corrected/not present: refer to a renal dietician.

CKD and sodium bicarbonate: if CKD and sodium bicarbonate <22mmol/L, sodium bicarbonate should be used with/without hyperkalaemia (likely a decision for the renal specialist!).

Drug acronyms

ACEi: angiotensin-converting enzyme inhibitor, e.g. ramipril

ARB: angiotensin receptor blocker, e.g. candesartan

MRA: mineralocorticoid receptor antagonist, e.g. spironolactone

Hyperkalaemia 2: causes and monitoring

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Hyperkalaemia: causes and risk factors

Community prevalence of hyperkalaemia is 0.5% (4.2% in CKD).

CAUSES:

- Drugs:
  - ACE inhibitors/ARBs/spironolactone/eplerenone.
  - Potassium supplements.
  - Potassium-sparing diuretic, e.g. amiloride (esp. with furosemide).
  - NSAIDs.
  - Macrogols, e.g. laxido, movicol, cosmocol.
  - Non-selective beta-blockers.
  - Trimethoprim/co-trimoxazole.
  - Digoxin toxicity.
  - Use of LoSalt in diet.
- Spurious result: delay processing sample, cold weather, sample-taking problems (small needle, clenched fist).
- Extreme physical exercise, crush injury or hypothermia (causes rhabdomyolysis).
- Excessive dietary intake, e.g. fruit, veg and processed foods (most significant if CKD).
- Tumour lysis syndrome.
- Addison's disease.

RISK FACTORS:

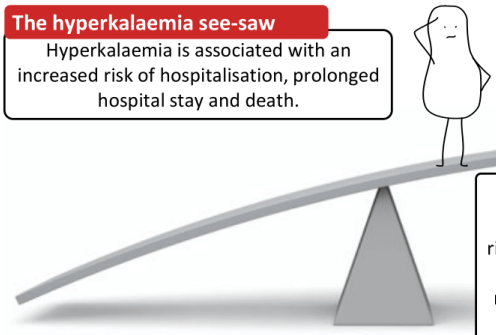
- Renal impairment, diabetes, heart failure, multimorbidity and/or serum bicarbonate <25mmol/L.

Prevention is better than cure

If CKD, heart failure or diabetes: monitor U&Es 2–4 times/year (increased risk of hyperkalaemia due to disease/drugs).
Withhold ACEi/ARB/MRA during acute illness, and give information on sick day rules (risks of AKI and hyperkalaemia).
Monitor U&Es more frequently if acute illness, previous AKI or previous hyperkalaemia.
Caution when prescribing trimethoprim if on ACEi/ARB/MRA or renal impairment.

The hyperkalaemia see-saw

Hyperkalaemia is associated with an increased risk of hospitalisation, prolonged hospital stay and death.



The see-saw will be balanced differently for each individual.

Treatment of hyperkalaemia/initiation of sick day rules often requires a pause/discontinuation of a preventative drug. This risks suboptimal treatment of heart/renal disease and increases the risk of CV events, hospitalisation and death. In one study: mortality 4% if maintained on maximum ACEi/ARB/MRA, 8% if suboptimal dosing and 11% if treatment stopped.

Once potassium normalised

If ACE inhibitor/ARB/spironolactone/eplerenone has been stopped/halved, what was clinical indication for use?

- If for hypertension: consider alternative.
- If for heart failure with reduced ejection fraction OR kidney disease with albuminuria:
  - If had mild hyperkalaemia: continue but monitor carefully.
  - If had moderate hyperkalaemia: once potassium <5.5mmol/l, restart drug at lower dose (one at a time if >1 stopped) and monitor carefully.

Monitor for signs of heart failure, deterioration in renal function and/or rising potassium.

Starting and monitoring ACEi/ARB and MRAs

	ACEi/ARB	MRA
Before starting:	Check U&Es. Caution starting if K+ >5.0mmol/L.	Check U&Es. Do not start if K+ >5.0mmol/L or eGFR <30ml/min.
Monitoring on treatment:	Check U&Es 1–2w after starting and after each dose titration.	Check U&Es 1w after starting and after each dose titration; then monthly for 3m; then 3-monthly for the first year; then 4-monthly ongoing.
If creatinine rises, see *Acute kidney injury* article for management, including when to stop ACEi/ARB/MRA.		

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Keywords: hyperkalaemia, potassium, ECG, P waves, peaked T waves, ACE, ARB, spironolactone, ep-lerenone, potassium supplements, potassium-sparing diuretic, LoSalt