University Hospitals of Derby and Burton
NHS Foundation Trust

Hypokalaemia (General Wards) - Full Clinical Guideline

Reference Number: CG-T/2023/169

Introduction

This guideline applies to the management of hypokalaemia in adult patients on general wards. It does not apply to:

- renal or critical care area patients: see appropriate protocols
- as a reversible cause of cardiac arrest: manage as per ALS course materials
- diabetic ketoacidosis or hyperosmolar hyperglycaemic state: follow diabetes guidelines
- For children please see guideline available on Koha (Intravenous fluids paediatric clinical guideline reference: CH CLIN G44

Aim and purpose

To provide guidance for safe, effective potassium replacement within the general medical or surgical ward environment.

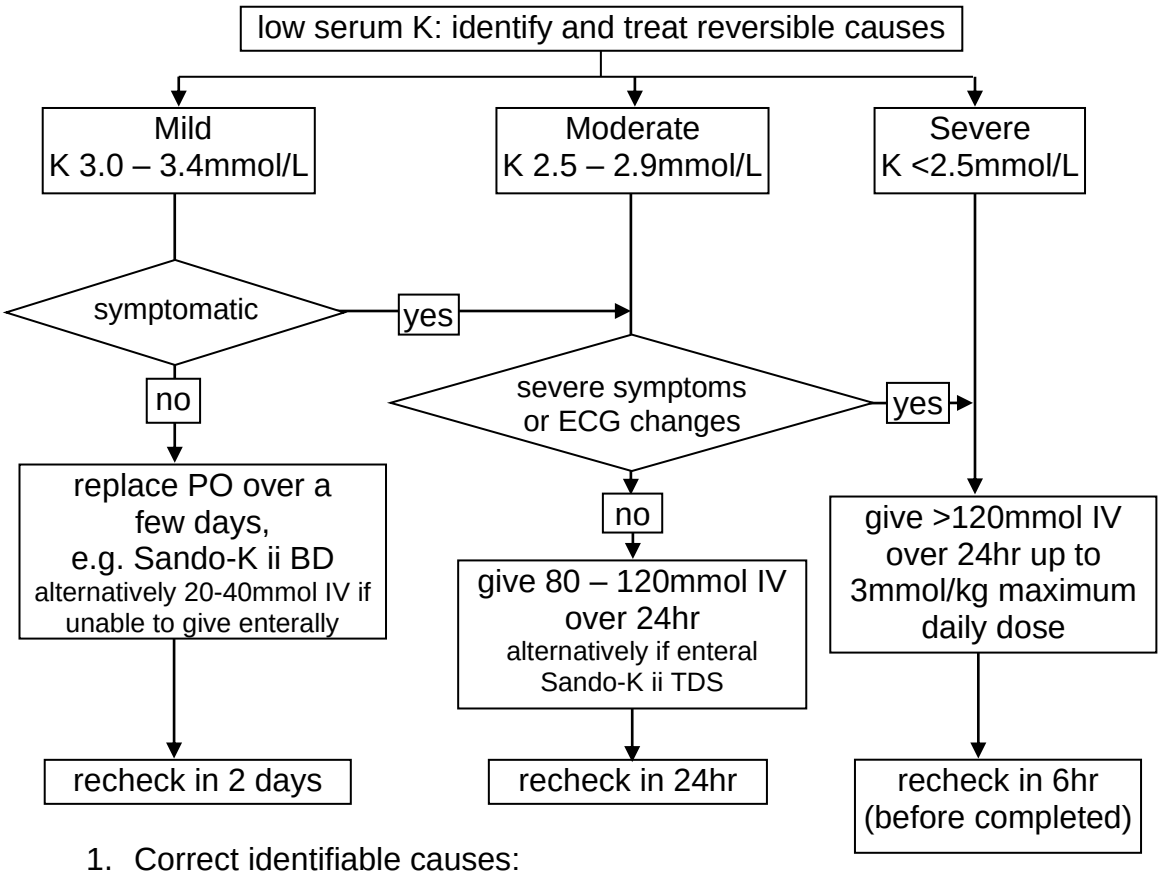
Classification of hypokalaemia:

Serum potassium concentration	**Potential symptoms**
3.0-3.4 mmol/L **mild**	Usually no symptoms, *arrhythmias
2.5-2.9 mmol/L **moderate**	Generalised weakness, lassitude and constipation, *arrhythmias
2.0-2.4 mmol/L **severe**	Muscle weakness and necrosis, myocardial infarction *arrhythmias
Less than 2.0 mmol/L **emergency**	Paralysis and impairment of respiratory function, *arrhythmias
* In patients with ischaemic heart disease, heart failure, or left ventricular hypertrophy, even mild hypokalaemia increases the likelihood of arrhythmias.	

Hypokalaemia will also exacerbate digoxin toxicity.

Treatment of hypokalaemia

Although this document offers guidance, the dose of potassium to treat hypokalaemia should be determined on an individual patient basis. Chronic hypokalaemia indicates a profound deficit in total body potassium and replacement may take several days. Failure to correct hypokalaemia despite appropriate treatment may be due to underlying hypomagnesaemia. All patient patients with hypokalaemia should have a magnesium level checked.



1. Correct identifiable causes:

- decreased intake
- increased loss
  - GI losses
  - urinary losses via loop/thiazide diuretics or aminoglycosides
  - polydipsia/polyuria
  - increased mineralocorticoid activity
  - hypomagnesaemia
  - review acid-base status
  - consider 24hr urinary potassium level
- increased entry to cells
  - β-agonists e.g. salbutamol, dobutamine, OTC/"slimming" sympathomimetics
  - theophyllines/xanthines (inc. caffeine)
  - alkalosis

- increased haematopoesis e.g. with GCSF, acute leukaemia

2. Replace potassium if due to decreased intake or increased loss; replace cautiously if hypokalaemia is due to increased distribution as a result of cellular uptake - potassium may subsequently return to plasma from cells causing hyperkalaemia.

Enteral replacement

Sando-K is to be used first-line for all doses over 12mmol.

Each Sando-K tablet contains 12mmol of Potassium. Sando-K tablets can be dissolved in squash or juice to mask the taste, or crushed and mixed into a small amount of soft food, like jam or honey. Sando-K are suitable for administration via enteral tubes (further detail below).

Serum potassium concentrations	Suggested oral replacement	Suggested monitoring
3.0 - 3.5 mmol/L (mild hypokalaemia)	Sando-K® 2 tablets twice a day (48mmol/day)	Monitor serum potassium every 2-3 days until stable or >4.5 mmol/L, then re-assess
2.5 - 2.9 mmol/L (moderate hypokalaemia)	Sando-K® 2 tablets three times a day (72mmol/day)	Monitor serum potassium daily until >2.9 mmol/L then manage as for mild hypokalaemia (above).

An unlicensed potassium chloride 1mmol/ml oral solution should only be considered if there is a true intolerance to Sando-K.

Intravenous replacement

Serum potassium concentrations	Suggested IV replacement	Suggested monitoring
3.0-3.4 mmol/L (mild hypokalaemia, if patient unable to take potassium enterally)	20 - 40 mmol potassium chloride in 1 litre sodium chloride 0.9% over at least 8 hours. Can be repeated up to a maximum of 3mmol/kg/day	Monitor serum potassium after 24 hours and review accordingly. Repeat infusion if appropriate. Switch to oral management as soon as practical.
2.5 – 2.9mmol/L (moderate hypokalaemia)	80 - 120mmol potassium chloride in 2 - 3 litres sodium chloride 0.9% over 24hr, up to a maximum of 3mmol/kg/day	Monitor serum potassium concentration after 24 hours and repeat infusion if appropriate.

≤ 2.4 mmol/L (severe hypokalaemia and/or symptomatic)	40 mmol potassium chloride in 1 litre sodium chloride 0.9% over 6 hours, to repeat after potassium level. Maximum should not exceed 3mmol/kg/day	Monitor serum potassium concentration after 6 hours and repeat infusion as appropriate up to maximum.

The **maximum daily dose of potassium for replacement is 3mmol/kg** unless significant renal impairment – use approximately half usual dose and seek renal advice. **In the presence of hypomagnesaemia, magnesium should ordinarily be replaced first in order to aid distribution of potassium replacement.**

The **maximum rate of infusion** in a general ward environment is **10mmol/hr**. This can be increased to 20mmol/hr provided continuous cardiac monitoring is in place. Higher rates are associated with significant risk of cardiac arrhythmia and arrest.
Potassium should be given via an infusion pump to ensure a safe rate.
The **maximum concentration** of IV potassium for general peripheral use is **40mmol/L** as per NPSA. This is due to potential for pain and phlebitis with peripheral administration.
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Initial IV replacement of potassium should usually be in sodium chloride 0.9%.
This is because administration of a glucose-containing infusion will prompt a physiological insulin response causing further intracellular migration of potassium.
There is a list of commercially available potassium fluids at the end of this guide.

Potassium may be given **subcutaneously**, but this would usually be for maintenance fluids rather than replacement. This is because of the limitations on concentration and rate, and also the slow absorption by the subcutaneous route.
When given subcutaneously, the maximum potassium concentration that should be used is 40mmol/L at a maximum rate of 2L/24hr via gravity feed not via infusion pump.

Special cases

Fluid restriction:
Concentrations >40mmol/L should normally be given via a central line, however in fluid restricted patients administration of 60-80mmol/L via a large vein may be an option: seek senior advice.
Alternatively consider combining enteral and intravenous replacement.
Patients with **central venous access** can receive more concentrated solutions: again, **seek senior advice**.
Provision varies by site:

- RDH – prepared by pharmacy outside of ICU, contact ward or on-call pharmacist
- QHB – can be prepared and given on CCU

Enteral administration via feeding tubes:
Intragastric (NG, PEG, RIG, NJ, Jejunostomy) – use Sando-K unless the patient has an intolerance to an excipient. Oral Potassium Chloride 1mmol/ml solutions are available but are unlicensed and are not recommended in patients requiring doses of 12mmol or more.[1] The excipients in unlicensed oral solutions may vary, so confirm with pharmacy if you need to check the excipient list. Note that liquids may contain sorbitol which will cause diarrhoea for patients with NJ/Jejunostomy, as it will enter the jejunum undigested.

[1] National Patient Safety Alert 011/2024 - Discontinuation of Kay-Cee-L Syrup

Use of diuretics

Where hypokalaemia is associated with use of loop and/or thiazide diuretics, consideration should be given to the use/addition of a potassium-sparing diuretic or aldosterone antagonist e.g. amiloride, spironolactone. This will reduce potassium losses and mitigate the need for replacement.

Commercially available potassium solutions

20mmol potassium chloride in 1L 0.9% sodium chloride
40mmol potassium chloride in 1L 0.9% sodium chloride
20mmol potassium chloride in 1L 5% glucose
20mmol potassium chloride in 500ml 5% glucose (run 2 sequentially for 40mmol/1L)
20mmol potassium chloride in 1L 0.18% sodium chloride 4% glucose
40mmol potassium chloride in 1L 0.18% sodium chloride 4% glucose

Contact your ward or on-call pharmacist to discuss options if your patient requires a more concentrated solution: provision will vary by site.

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Documentation controls:

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