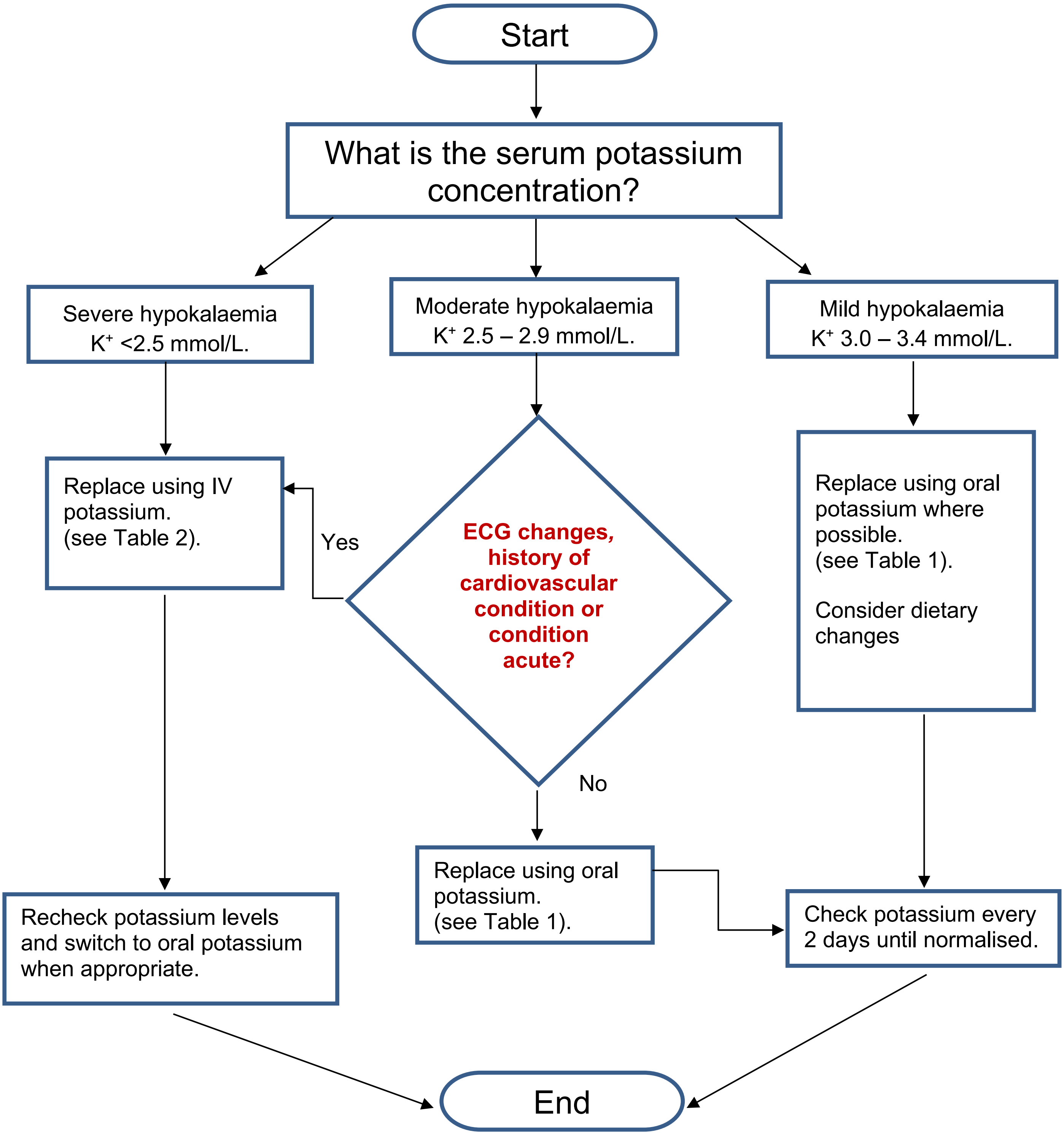
Royal Cornwall Hospitals
NHS Trust

Management of Hypokalaemia in Adults Clinical Guideline

V4.0

October 2025

Summary



Check other electrolyte levels, particularly magnesium and phosphate.

1. Aim/Purpose of the Guideline

1.1. To provide clinical staff with guidance related to the management of hypokalaemia in adult patients on general medical and surgical wards.

1.2. Patients with hypokalaemia in areas where there is the ability to perform continuous ECG monitoring, central venous access and appropriately trained staff (such as on the Intensive Care Unit) may be managed differently to as is specified in this guideline. Seek senior or specialist advice if needed.

1.3. This version supersedes any previous versions of this document.

2. The Guidance - Definitions

2.1. **What is hypokalaemia?**

2.1.1. The reference range for serum potassium used at the Royal Cornwall Hospitals Trust is 3.5 – 5.3 mmol/L.

2.1.2. For the purposes of this guideline, hypokalaemia is defined as a serum blood potassium concentration of less than 3.5mmol/L.

2.1.2.1. Mild hypokalaemia: potassium concentration 3.0 – 3.4 mmol/L.

2.1.2.2. Moderate hypokalaemia: potassium concentration 2.5 – 2.9 mmol/L.

2.1.2.3. Severe hypokalaemia: potassium concentration <2.5 mmol/L.

2.2. **Causes of hypokalaemia**

2.2.1. **Increased potassium excretion** – this is the most common mechanism of hypokalaemia and typically involves:

2.2.1.1. Excessive renal secretion of potassium due to medication use (see section 2.3), urinary loss in congestive heart failure, or endocrine disorders such as primary or secondary hyperaldosteronism and Cushing's syndrome.

2.2.1.2. Increased gastrointestinal losses of potassium due to severe or prolonged diarrhoea or vomiting, excessive use of laxatives, or intestinal obstructions or fistula.

2.2.1.3. Excessive skin excretion of potassium due to excess sweating without adequate electrolyte replacement, burns or other dermatological conditions particularly affecting large areas of the skin.

2.2.2. **Increased cellular uptake of potassium (intracellular shift)** – can occur through several mechanisms including increased extracellular pH due to metabolic acidosis, refeeding syndrome and medication use (see section 2.3).

2.2.3. **Decreased potassium intake** – a rare cause of hypokalaemia but may contribute to the severity of hypokalaemia in the presence of another cause.

Involves inadequate dietary intake of potassium such as due to illness or fasting, eating disorders such as anorexia nervosa or bulimia, or eating an unbalanced diet.

2.3. **Medications that can cause hypokalaemia*:**

2.3.1. Diuretics – thiazide like diuretics (e.g. bendroflumethaizide) and loop diuretics (e.g. furosemide).

2.3.2. Aminoglycoside antibiotics – e.g. gentamicin and amikacin.

2.3.3. Beta agonists – e.g. salbutamol and terbutaline.

2.3.4. Insulins – insulin stimulates cellular uptake of glucose which in turn stimulates cellular uptake of potassium.

2.3.5. Corticosteroids – e.g. fludrocortisone and hydrocortisone.

2.3.6. Xanthines – theophylline and aminophylline.

2.3.7. Adrenaline and pseudoadrenaline.

2.3.8. Beta-lactam antibiotics – penicillins, cephalosporins and carbapenems.

2.3.9. Proton pump inhibitors – e.g. omeprazole, lansoprazole.

*This list is not exhaustive

2.4. **Signs of symptoms of hypokalaemia depend on the severity of potassium depletion.**

2.4.1. Mild hypokalaemia – usually asymptomatic but patients may present with arrhythmias, weakness, constipation, nausea, muscle cramps and fatigue.

2.4.1.1. There is an increased likelihood of arrhythmias in patients with ischaemic heart disease, heart failure or left ventricular hypertrophy.

2.4.1.2. ECG changes may include a flat or inverted T wave, ST segment depression and prominent U waves.

2.4.2. Moderate hypokalaemia – symptoms present as above but are more pronounced. Muscle necrosis and arrhythmia can occur in patients with underlying cardiac issues.

2.4.3. Severe hypokalaemia – cardiac arrhythmias, paralysis of legs and respiratory muscles, rhabdomyolysis, ileus, myoglobinuria and acute renal failure.

2.5. Treatment

2.5.1. There are no national guidelines for the treatment of acute hypokalaemia.

2.5.2. The underlying cause of hypokalaemia should be identified and corrected before considering potassium supplementation (see sections 2.2 and 2.3).

2.5.3. There is an association between potassium and magnesium deficiencies. Patients with low potassium levels should have their magnesium levels checked as it can be very difficult to correct hypokalaemia in the presence of hypomagnesaemia.

2.5.4. The normal daily requirement of potassium for an adult is 50-100 mmol (1 mmol/kg). This needs to be considered when supplementing potassium if there is no other intake (e.g. from foods).

2.5.4.1. Dietary sources of potassium include tomatoes, green and leafy vegetables, potatoes, white mushrooms, nuts, seeds, legumes and fruit.

2.5.4.2. Be aware that increasing dietary potassium is inadequate for correcting non-dietary causes of hypokalaemia.

2.6. Oral potassium administration

2.6.1. For use in:

- Asymptomatic mild hypokalaemia (K^+ 3.0 – 3.4 mmol/L).
- Asymptomatic moderate hypokalaemia (K^+ 2.5 – 2.9 mmol/L).

Table 1: Suggested dose for oral replacement therapy

Preparation	Route	Dose	Serum potassium monitoring
Sando-K (each tablet contains 12 mmol potassium and 8 mmol chloride)	Oral	2 tablets three times a day. Total dose = 72 mmol/day	Monitor daily and continue treatment until potassium level is stable within reference range (usually after about 3 days)

2.6.2. Dose and duration of treatment depends on the existing potassium deficit and whether there are continuing losses. Larger doses may be required in patients with digitoxicity or diabetic ketoacidosis. Specialist advice should be sought in such situations.

2.6.3. Side effects of oral potassium replacement include abdominal discomfort, diarrhoea, nausea and vomiting.

2.6.4. If gastric irritation occurs, Sando-K should be given with or after food.

2.6.5. Excessive doses can lead to hyperkalaemia (see section 3.5).

2.7. Intravenous potassium administration

2.7.1. For use in:

- Symptomatic hypokalaemia.
- Severe hypokalaemia (K^+ < 2.5 mmol/L).
- Patients with hypokalaemia who are unable to tolerate oral therapy, or when the oral route is inappropriate (e.g. no oral absorption).

2.7.2. Commercially available ready-mixed potassium infusion solutions should be used where possible.

2.7.3. Ready-to-administer dilute potassium infusions that may be administered via a peripheral or central venous access device contain 20-40mmol/L potassium in sodium chloride 0.9%, glucose 5%, glucose 10% and sodium/glucose mixtures.

Ready mixed potassium solutions available for use at RCHT:

- 10mmol potassium in 500mL bag (0.15% w/v).
- 20mmol potassium in 1000mL bag (0.15% w/v).
- 20mmol potassium in 500mL bag (0.3% w/v).
- 40mmol potassium in 1000mL bag (0.3% w/v).
- 40mmol potassium in 500mL bag (0.6% w/v).

2.7.4. Table 2 shows suggested initial doses, infusion fluids and monitoring requirements for intravenous potassium replacement therapy in patients with normal renal function.

Table 2: Suggested initial doses for intravenous replacement therapy (assuming normal renal function):

Serum potassium concentrations	Suggested IV replacement	Serum potassium monitoring
2.5 – 3.4 mmol/L (e.g., if patient unable to take potassium orally)	20 – 40 mmol potassium chloride in 1 litre sodium chloride 0.9% over at least 8 hours.	Monitor after 24 hours. Repeat infusion if appropriate. Switch to oral management as soon as practical.
< 2.5 mmol/L or patient symptomatic	40 mmol potassium chloride in 1 litre sodium chloride 0.9% over 6 hours.	Monitor after 6 hours and repeat infusion if appropriate.

2.7.5. Initial potassium replacement therapy should not involve glucose infusions, as administration of glucose may result in further decrease of the plasma-potassium concentration.

2.7.6. The rate of potassium administration should not exceed 10mmol/hour, unless in emergencies, then 20mmol/hour can be given for short periods with close cardiac monitoring, including continuous ECG monitoring.

Administration of potassium at high concentrations or at rates faster than recommended in this guideline may cause serious cardiac toxicity, including arrhythmia and cardiac arrest.

2.7.7. The maximum recommended concentration for peripheral infusion of potassium is 40mmol/L as higher strengths can cause phlebitis and pain.

2.7.8. The most concentrated potassium preparation available at RCH is 80mmol/L (40mmol in 500mL). This can be given peripherally in exceptional circumstances only (e.g. in severely fluid restricted patients).

This should be administered into a large vein with close monitoring of the injection site.

2.7.9. The maximum potassium dose that can be given in 24 hours is 3mmol/kg assuming normal renal function. Care needs to be taken to avoid fluid overload.

2.8. Monitoring during intravenous potassium replacement

2.8.1. Urea and electrolytes, with special attention to the following:

- **Potassium**

  Monitor potassium levels as outlined in Table 1 (oral replacement therapy) and Table 2 (intravenous replacement therapy).

- **Magnesium**

  Failure to correct hypokalaemia despite appropriate treatment may be due to underlying hypomagnesaemia, which may require treatment with magnesium supplementation. Refer to Trust clinical guideline for treatment of hypomagnesaemia in adults.

- **Chloride**

  Potassium depletion is frequently associated with chloride depletion and metabolic alkalosis. Regular monitoring of acid-base balance is essential. Ongoing metabolic alkalosis can be an indicator of potassium deficiency.

2.8.2. Renal function

2.8.2.1. Potassium is excreted renally therefore accumulation can occur in patients with poor kidney function.

2.8.2.2. Replace potassium with extreme caution in patients with severe renal impairment and monitor frequently. Seek specialist advice from the renal team.

2.8.2.3. Lower doses of replacement therapy are required for patients with renal disease.

2.8.3. ECG and blood pressure

2.8.3.1. There is no routine requirement for continuous ECG monitoring in all patients receiving IV potassium infusions; however, continuous ECG monitoring is recommended in the following patients:

- Patients receiving infusion rates exceeding 20mmol per hour due to risk of serious arrhythmia or cardiac arrest.

- Patients with existing cardiac disease.

- Patients receiving digoxin. Hypokalaemia can predispose to digitalis toxicity.

2.8.3.2. Correction of hypokalaemia may lower blood pressure therefore regular monitoring of blood pressure is advised.

2.8.4. Injection site

2.8.4.1. Extravasation and tissue damage can occur due to high osmolarity of low pH.

2.8.4.2. Monitor for pain and phlebitis at the infusion site, particularly when potassium is given at higher concentrations.

2.9. Adverse effects of potassium replacement

2.9.1. Excessive doses of potassium can lead to the development of hyperkalaemia; the risk is higher in patients with renal impairment.

2.9.2. Symptoms of hyperkalaemia include:

2.9.2.1. Cardiovascular – cardiac arrhythmias, heart block and cardiac arrest.

2.9.2.2. Musculoskeletal – muscle weakness and paralysis.

2.9.2.3. Neurological – paresthesia of extremities and confusion.

2.9.2.4. Extravasation injury – pain, phlebitis and serious tissue injury following intravenous potassium administration via peripheral veins, particular at higher concentrations.

2.10. Drug interactions with potassium

2.10.1. Potassium supplementation should be used with caution in patients receiving concomitant drugs that increase serum potassium levels. These include:

- Potassium-sparing diuretics – spironolactone, amiloride, triamterene, co-amilofruse, co-amilozide.

- Angiotensin converting enzyme (ACE) inhibitors – ramipril, lisinopril.

- Angiotensin II receptor antagonists (ARBs) – irbesartan, losartan, candesartan.

- Tacrolimus.

- Ciclosporin.

2.10.2. Note the potential potassium content of other intravenously administered drugs (e.g. potassium salts of penicillins).

3. Monitoring compliance and effectiveness

Information Category	Detail of process and methodology for monitoring compliance
Element to be monitored	Compliance with prescribing and administration in accordance with this guideline (or other safe practice).
Lead	Alison Hill, Medicines Safety Pharmacist.
Tool	Incident reports via DATIX system.
Frequency	Serious incidents to be reviewed as they are received to establish whether urgent change to the guideline is necessary. Other minor incidents to be reviewed when the guideline is reviewed as appropriate.
Reporting arrangements	The completed report to be sent to the Medicines Safety Group for review.
Acting on recommendations and Lead(s)	The Medicines Safety Group will report any necessary actions to the Medicines Practice Committee.
Change in practice and lessons to be shared	Required changes to practice will be identified and actioned within three months. A lead member of the team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders.

4. Equality and Diversity

4.1. This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the Equality Diversity And Inclusion Policy or the Equality and Diversity website.

4.2. Equality Impact Assessment

The Initial Equality Impact Assessment Screening Form is at Appendix 2.

Appendix 1. Governance Information

Information Category	Detailed Information
Document Title:	Management of Hypokalaemia in Adults Clinical Guideline V4.0
This document replaces (exact title of previous version):	Management of Hypokalaemia in Adults Clinical Guideline V3.0
Date Issued/Approved:	10 October 2025
Date Valid From:	October 2025
Date Valid To:	October 2028
Author/Owner:	Heather Fothersgill, Pharmacy Medicines Information
Contact details:	01872 252587
Brief summary of contents:	This guideline provides guidance on the appropriate management of hypokalaemia in adults.
Suggested Keywords:	Hypokalaemia, Potassium.
Target Audience:	**RCHT:** Yes **CFT:** No **CIOS ICB:** No
Executive Director responsible for Policy:	Chief Medical Officer
Approval route for consultation and ratification:	Medicines Practice Committee
Manager confirming approval processes:	Richard Andrzejuk
Name of Governance Lead confirming consultation and ratification:	Kevin Wright
Links to key external standards:	1. Baxter Healthcare Ltd. Summary of Product Characteristics for Potassium Chloride 0.15%w/v & Sodium Chloride 0.9%w/v Solution for Infusion – BP. Last updated on the eMC 10 Mar 2025. Accessed via: http://www.medicines.org.uk/emc/ on 16 Sep 2025.

Information Category	Detailed Information
	2. Brayfield A (ed). Martindale: The Complete Drug Reference. [online] London: Pharmaceutical Press. Accessed via: www.medicinescomplete.com on 28 Aug 2025. 3. CKS 2025 Hypokalaemia. Clinical Knowledge Summaries. Accessed via: http://cks.nice.org.uk/ on 20 Aug 2025. 4. Joint Formulary Committee. British National Formulary (online) London: BMJ Group and Pharmaceutical Press. Accessed via: http://www.medicinescomplete.com/ on 20 Aug 2025. 5. National Patient Safety Agency 2002. Potassium Solutions: Risks to Patients from Errors Occurring During Intravenous Administration. Accessed via: https://webarchive.nationalarchives.gov.uk/ on 20 Aug 2025. 6. NHS Injectable Medicines Guide (Medusa). Potassium Chloride Infusion Dilute (40mmol/L or less) for PERIPHERAL Access. Accessed via: www.medusaimg.nhs.uk/ on 22 Aug 2025. 7. Specialist Pharmacy Service. Treating Acute Hypokalaemia in Adults. Published 14 Aug 2024. Accessed via: www.sps.nhs.uk on 20 Aug 2025. 8. Stirling Anglian Pharmaceuticals Ltd. Summary of Product Characteristics for Sando K. Last updated on the eMC 24 May 2024. Accessed via: http://www.medicines.org.uk/emc/ on 16 Sep 2025.
Related Documents:	Hyperkalaemia, hyponatraemia, hypomagnesaemia and hypophosphatemia guidelines.
Training Need Identified:	No
Publication Location (refer to Policy on Policies – Approvals and Ratification):	Internet and Intranet
Document Library Folder/Sub Folder:	Clinical / Pharmacy

Version Control Table

Date	Version Number	Summary of Changes	Changes Made by
May 2016	V1.0	Initial issue	Liam Kelly, Medicines Information Pharmacist
July 2019	V2.0	Reformatted to match other electrolyte guidelines. Updated summary page to match advice given in guideline. Points 2.4 and 3.1 amalgamated into point 3.1. Point 3.1.4 removed, as information thought superfluous. Information on subcutaneous administration updated to include monitoring of injection site for concentrations of 34-40mmol/L Point 7 removed as felt to be superfluous/most information already stated elsewhere as well. Complicated calculations removed for simplicity and usability	Bronwin Staple, Medicines Information Pharmacist
July 2022	V3.0	Incorporated into new clinical guideline template. Corrected formatting issues that led to incorrect numbering of sections. Would have created confusion when different numbered sections are referred to within the guideline. Changed all references to potassium level range of 3.0 – 3.5 to 3.0 – 3.4mmol/L as normal range is 3.5 – 5.3mmol/L Points 1.1 and 1.2 added to highlight treatment of hypokalaemia in patients on higher dependency wards with additional monitoring e.g., critical care, may differ to that specified in this guideline. This is following feedback that in areas such as theatres / resus / critical care etc. there is sometimes a need to give a more concentrated form of potassium than that recommended in this guideline Added table of ready-mixed potassium solutions available for use at RCHT to give clinicians a clearer overview.	Lisa Thomas, Medicines Information Pharmacist
October 2025	V4.0	Reformatted flowchart.	Heather Fothersgill, Lead Medicines

Date	Version Number	Summary of Changes	Changes Made by
		Expanded on definition of hypokalaemia to include stages of hypokalaemia and relevant reference ranges. Section 2.2 re-written and more detail added regarding causes of hypokalaemia. Removed amphotericin, cisplatin and foscarnet from list of drugs that cause hypokalaemia and added note that current list is not exhaustive. Dietary sources of potassium. Table 1 re-formatted and instructions for potassium monitoring added. Table of ready mixed potassium solutions removed, and information re-formatted more simply into body of the text. Removed section on subcutaneous administration as this would only be considered in exceptional circumstances. Reference to Trust guideline for treatment of hypomagnesaemia added to information regarding monitoring of magnesium levels. Added recommendation to monitor blood pressure regularly. References added.	Information Pharmacist

All or part of this document can be released under the Freedom of Information Act 2000.

All Policies, Strategies and Operating Procedures, including Business Plans, are to be kept for the lifetime of the organisation plus 6 years.

This document is only valid on the day of printing.

Controlled Document.

This document has been created following the Royal Cornwall Hospitals NHS Trust The Policy on Policies (Development and Management of Knowledge Procedural and Web Documents Policy). It should not be altered in any way without the express permission of the author or their Line Manager.

Appendix 2. Equality Impact Assessment

Section 1: Equality Impact Assessment (EIA) Form

The EIA process allows the Trust to identify where a policy or service may have a negative impact on an individual or particular group of people.

For guidance please refer to the Equality Impact Assessment Policy (available from the document library) or contact the Equality, Diversity, and Inclusion Team rcht.inclusion@nhs.net

Information Category	Detailed Information
Name of the strategy/policy/proposal/service function to be assessed:	Management of Hypokalaemia in Adults Clinical Guideline V4.0
Department and Service Area:	Pharmacy
Is this a new or existing document?	Existing
Name of individual completing EIA (Should be completed by an individual with a good understanding of the Service/Policy):	Heather Fothersgill, Medicines Information Pharmacist
Contact details:	01872 252587

Information Category	Detailed Information
1. Policy Aim - Who is the Policy aimed at? (The Policy is the Strategy, Policy, Proposal or Service Change to be assessed)	This guideline has been written to inform doctors, pharmacists and nursing staff and provide reference in the management of hypokalaemia in adult patients.
2. Policy Objectives	Guide the management of hypokalaemia.
3. Policy Intended Outcomes	Guide the management of hypokalaemia.
4. How will you measure each outcome?	Monitor incident reports.
5. Who is intended to benefit from the policy?	Doctors, pharmacists, nurses, patients.

Information Category	Detailed Information
6a. Who did you consult with? (Please select Yes or No for each category)	• Workforce: Yes • Patients/visitors: No • Local groups/system partners: No • External organisations: No • Other: No
6b. Please list the individuals/groups who have been consulted about this policy.	**Please record specific names of individuals/ groups:** Incident reports
6c. What was the outcome of the consultation?	Agreed.
6d. Have you used any of the following to assist your assessment?	**National or local statistics, audits, activity reports, process maps, complaints, staff, or patient surveys:** No

7. The Impact

Following consultation with key groups, has a negative impact been identified for any protected characteristic? Please note that a rationale is required for each one.

Where a negative impact is identified without rationale, the key groups will need to be consulted again.

Protected Characteristic	(Yes or No)	Rationale
Age	No	
Sex (male or female)	No	
Gender reassignment (Transgender, non-binary, gender fluid etc.)	No	
Race	No	
Disability (e.g. physical or cognitive impairment, mental health, long term conditions etc.)	No	
Religion or belief	No	
Marriage and civil partnership	No	

Protected Characteristic	(Yes or No)	Rationale
Pregnancy and maternity	No	
Sexual orientation (e.g. gay, straight, bisexual, lesbian etc.)	No	

A robust rationale must be in place for all protected characteristics. If a negative impact has been identified, please complete section 2. If no negative impact has been identified and if this is not a major service change, you can end the assessment here.

I am confident that section 2 of this EIA does not need completing as there are no highlighted risks of negative impact occurring because of this policy.

Name of person confirming result of initial impact assessment: Heather Fothersgill, Medicines Information Pharmacist

If a negative impact has been identified above OR this is a major service change, you will need to complete section 2 of the EIA form available here:
Section 2. Full Equality Analysis