Clinical Guideline for the Management of Hyperkalaemia in Inpatients

Authors	Dr Beas Bhattacharya, Dr Ijaz Ahmed, Dr Laura Gonsalez, Dr Tanaji Dasgupta
Date of ratification	
Approved By	Trust Guideline Committee
This document replaces	N/A: First Version
Date of review	15/8/2016

Table of Contents

1. Scope and Purpose of the Guidelines 3
2. Responsibilities 3
3. Initial Assessment 3
4. Is urgent treatment required? 4
5. Monitoring the Patient 4
6. Treatment of Hyperkalaemia 4
7. Referral Criteria 6
8. Management of Hyperkalaemia in a Cardiac Arrest 6
9. Audit Criteria 7
10. References 8

Appendix 1: Algorithm for Emergency Management of Hyperkalaemia in Adult Patients along with monitoring tool. 9

1. Scope and Purpose of the Guidelines

This guideline is seeks to provide guidance for the management of hyperkalaemia among inpatients in the Great Western Hospital.

2. Responsibilities

Supervising Consultant in charge of ongoing care for the patient.

3. Initial Assessment

3.1. All patients with known or suspected hyperkalaemia should undergo urgent assessment by nursing and medical staff to assess clinical status using the ABCDE approach, an early warning scoring system, and an appropriate escalation plan bearing in mind that the first presentation may be an arrhythmia.

3.2. Evaluation of the Patient: History, physical examination, review of medications and relevant laboratory blood tests are to form a part of individualised assessment of every patient. A myriad of health conditions and drugs can cause hyperkalaemia.

3.2.1. Hyperkalaemia should ideally be confirmed on repeat sampling, sample in those referred from primary care ideally with a fresh serum or at least with a venous blood gas sample. Haemolysis should be considered as a possibility and seek advice from the Biochemistry laboratory if in doubt.

3.2.2. Hyperkalaemia should be stratified as mild (5.5-5.9 mmol/L), moderate (6.0-6.4 mmol/L) or severe (≥6.5 mmol/L) to indicate severity and inform management.

3.2.3. All patients with a blood potassium value ≥ 6.0 mmol/L should have an urgent 12-lead ECG performed prior to receiving treatment for hyperkalaemia. A minimum of continuous 3-lead ECG monitoring for i) all patients with a serum potassium value ≥ 6.5 mmol/L, ii) patients with features of hyperkalaemia on 12-lead ECG, and iii) in patients with a serum potassium value between 6.0-6.4 mmol/L who are clinically unwell or in whom a rapid rise in serum potassium is anticipated, should be instituted.

4. Is urgent treatment required?

4.1. Urgent treatment is required if the serum potassium is > 7mmol/l.

4.2. Urgent treatment is required if hyperkalaemia is accompanied by ECG changes or symptoms even in the presence of mild hyperkalaemia (K+ 5.5 - 6.0). For ambulatory care patients (please refer to section 6.4)

5. Monitoring the Patient

5.1. A 12-lead ECG is mandatory in all patients with hyperkalaemia.

5.2. Cardiac monitoring is mandatory in all patients with severe hyperkalaemia or symptomatic patients, or patients with ECG changes until potassium level is normal (i.e. < 5.5mmol/L).

5.3. The ECG does not always demonstrate changes, even in the presence of severe hyperkalaemia, so a normal ECG does not obviate the need for therapy. However, the presence of ECG findings should be a strong indicator for urgent action.

6. Treatment of Hyperkalaemia

6.1. Treatment facility and setting: Treatment options are different for in-patients and ambulatory care patients based on clinical context and severity.

6.2. Severe Hyperkalaemia (>7.0) will require cardiac monitoring and is best managed at CCU, LAMU or Mercury Ward.

6.3. Inpatients (Refer to Appendix 1: Management Algorithm for Hyperkalaemia in Adults)

6.3.1. **Mild Hyperkalaemia (K^+ 5.5 – 5.9 mmol/L)** with no ECG changes and patient is asymptomatic: Treat underlying cause, monitor potassium at least daily until resolved, or returns to baseline level (that considered acceptable for the patient). Cation-exchange resins do not have a role in emergency treatment of severe hyperkalaemia, but may be considered in patients with mild to moderate hyperkalaemia where control over a longer period of time may be acceptable and in circumstances where dialysis is delayed or inappropriate. Calcium resonium 4 grams administered orally q.d.s can take 1 to 5 days. Constipation is common and required administration of concurrent administration of laxatives. Intestinal necrosis is a rare complication and should be borne in mind. Prolonged treatment is therefore not recommended.

6.3.2. **Moderate Hyperkalaemia (K^+ 6.0 - 6.5mmol/L)**: Treat as below (6.3.3) but without the use of nebulised salbutamol.

6.3.3. **Severe Hyperkalaemia (K^+>7 mmol/l, OR ECG changes OR symptoms even if potassium is <7 mmol/L)**:

6.3.3.1. *Protect the cardiac membrane if ECG changes are present*: 10% Calcium Gluconate 10ml of intravenously over 5 minutes (This intervention does not lower the potassium). If there are ECG changes, there should be improvement seen within 1-3 minutes. If improvement does not occur a further dose can be given intravenously in 5 minutes. Repeat Calcium Gluconate every 30 minutes if ECG changes do not settle (involve senior clinicians at this stage) until the ECG normalises. BEWARE OF EXTRAVASATION AS THIS CAN BE VERY PAINFUL AND CAUSES TISSUE NECROSIS. If the patient is taking digoxin and the decision is made that calcium gluconate is required, it should be given slower (over 30 minutes mixed in 100ml of glucose 5% as rapid calcium administration may precipitate myocardial digoxin toxicity).

6.3.3.2. *Shift the potassium from the blood into the cell:* Actrapid Insulin 10 units in 50ml 50% Dextrose over 15 minutes. Beware of, and monitor for hypoglycaemia after completion of insulin dextrose infusion. See monitoring regime in 6.3.4 for frequency of monitoring blood glucose and serum potassium.

6.3.3.3. *Coadministratration of nebulised salbutamol 2.5 – 5 mg may be used as an adjunct but not instead of IV insulin dextrose:* Use caution in those with resting tachycardia or ischaemic heart disease. This will lower the potassium by 0.5 to 1.0mmol/l by 15-30 minutes with the effect lasting at least 2 hours. Avoid in those on beta blockers and those with a history of cardiac arrhythmias.

6.3.4. Rechecking regime: Repeat serum K+ and blood glucose at 30 mins 60 mins, 120min, 240 and 360 mins after above measures instituted. The time to maximal effect with insulin-glucose ranges from 45-180 minutes and for nebulised salbutamol from 30-90 minutes. The aim of treatment is to achieve a serum K < 6.0 mmol/L within 2 hours of initiation of treatment. The reduction in K is 1.0mmol/L with insulin dextrose and 1.2mmol/L when used in combination with nebulised salbutamol.

6.3.5. Decision to retreat with medical therapy versus referral for haemofiltration: Consider aetiology and reversibility in guiding therapy. If renal failure with oliguria and acidosis if present, or aetiology suggests that hyperkalaemia likely to be persistent or progressive eg rhabdomyolysis, refer early for consideration of haemofiltration as per section 6.3.6.

6.3.5.1. a) If K>6.0mmol/L but reducing on repeat check at 4 hrs: Repeat Actrapid Insulin 10 units in 50ml 50% Dextrose over 15 min. b) If K <6.0mmol/L: continue with monitoring while correcting underlying cause c) If K+ continues to increase despite first dose of Actrapid Dextrose infusion and > 6.5mmol/L, discuss patient with ITU regarding CVVH.

6.3.5.2. Monitor for Hypoglycaemia: For a minimum of 6 hours post infusion.

6.3.5.3. Hyperglycaemic patients: If the serum glucose is ≥15mmol/l give insulin only (either as one-off injection or through sliding scale depending on clinical situations).

6.3.6. Removal of potassium from the body: If despite the above measures the potassium remains greater than 6.5 mmol/l or if pathological ECG changes persist, contact on call Medical SpR and seek help from intensive care for continuous venovenous haemofiltration, where this is appropriate.

The decision to refer for escalation of care should take place only after the initial resuscitation measures are underway, the response to treatment has been assessed and after consultation with a senior member of the team (SpR or above). This decision should take into account the likelihood of survival (e.g. reversible illness), extent of comorbidity, accurate assessment of pre-morbid functional status, and the patient's wishes. Consultation between senior physician/ surgeon and the intensive care team should be individualised and undertaken promptly to avoid further clinical deterioration.

If the patient is already receiving dialysis, discuss the patient with the Renal team (Ext 7346 or via switchboard during working hours, and with Renal Registrar at Churchill Hospital via switchboard out of hours).

6.4. Management on the Ambulatory Care Unit

6.4.1. Mild Hyperkalaemia (<6mmol/L):If the patient was considered for the same-day dishcharge, plan should be made to check blood in community in an interval based on patient's condition. The clinican must be satisfied that the hyperkalemia not likely to deteriorate, and that a cause been found and corrected if possible.

6.4.2. Moderate Hyperkalaemia (6.0-6.5mmol/L): Treatment should be given in moderate cases, both to facilitate discharge and ensure that potassium level is safe in the community. Patients on renal replacement therapy should be discussed with the Renal Team.

6.4.3. Severe Hyperkalaemia (>7.0mmol/L): These patients are not suitable for same day treatment and discharge.

7. Referral Criteria

7.1. Patients with severe hyperkalaemia (serum potassium > 6.5 mmol/L) should begin treatment as per the above protocol and referral to either the renal team or to ITU should be guided by the clinical scenario and its persistence after initial medical treatment.

7.2. Patients with severe hyperkalaemia and problems with airway, breathing and/ or circulation (ABC), should be referred to the ITU team in the first instance and without delay if this is appropriate. (see section 6.3.6)

8. Management of Hyperkalaemia in a Cardiac Arrest

8.1. The universal ALS algorithm applies to all patients and the initial steps of recognition of cardiac arrest, initiating high-quality CPR with minimal interruption, and attempting defibrillation if required, are independent of the cause of cardiac arrest. During CPR, reversible causes should be considered and treated. If the serum potassium is ≥ 6.5 mmol/L early in the resuscitation attempt, then hyperkalaemia may be responsible for the cardiac arrest. Hyperkalaemia occurring late in the resuscitation attempt may be the consequence of progressive acidosis and hypoxia, and may not be the precipitant of the cardiac arrest or require specific intervention. Early liaison with the ICU team is advised to establish whether renal replacement therapy is advisable if ROSC is not achieved within 15-30 minutes of CPR if ongoing resuscitation is deemed appropriate.

9. Audit Criteria

9.1. The following audit criteria are to be adopted for future assessment of adherence to these guidelines:

1. Incidence and outcomes of patients with hyperkalaemia diagnosed:
    1. in the community
    2. in the out-patient clinic
    3. after hospital admission
2. Proportion of patients where there has been a delay of > 24 hours in the recognition of hyperkalaemia.
3. Outcome measures in patients diagnosed with hyperkalaemia:
    1. Length of hospital stay
    2. In-hospital mortality
4. Proportion of patients with a blood potassium value ≥ 6.0 mmol/L who had a 12-lead ECG performed prior to treatment [Audit standard: 100%].
5. Proportion of patients with a blood potassium value ≥ 6.0 mmol/L and an ECG showing features of hyperkalaemia who had their 12-lead ECG repeated following treatment [Audit standard: 100%].
6. Proportion of patients with a blood potassium value ≥6.5 mmol/L who have documented evidence of continuous ECG monitoring [Audit standard: 100%]
7. The frequency of ECG changes in patients treated with intravenous calcium salts.
8. Adverse events as a result of treatment with intravenous calcium salts.
9. The proportion of patients with severe hyperkalaemia (K^+ ≥ 6.5 mmol/L) treated with insulin-glucose infusion [Audit Standard: 100%].
10. The proportion of patients with severe hyperkalaemia treated with resins [Audit Standard; 0%].
11. The proportion of patients in whom serum K^+ was measured at least once within 2 hours of treatment for severe hyperkalaemia [Audit Standard: 100%].
12. The proportion of patients in whom a serum K^+ was not performed within 6 hours of identification of hyperkalaemia [Audit Standard: 0%].
13. The proportion of patients who have at least one blood glucose test performed with 1 hour of completion of insulin-glucose infusion [Audit Standard: 100%].
14. Appropriateness and timeliness ICU referral.
15. Seniority of ICU personnel from whom advice was sought.
16. All cardiac arrests should be audited [Audit Standard 100%] – hospital participation in the National Cardiac Arrest Audit is encouraged as part of quality improvement and benchmarking.
17. Adverse events in relation to treatment of hyperkalaemia.
18. The frequency of prescribed drugs potentially contributing to hyperkalaemia.
19. The frequency of recurrence of hyperkalaemia beyond 48 hours after an acute episode.
20. The availability of guidelines and/ or education on hyperkalaemia in renal unit, emergency department or general ward [Audit Standard: 100%].

10. References

1. Renal Association Guidelines for Management of Hyperkalaemia March 2014

Appendix 1: Algorithm for Emergency Management of Hyperkalaemia in Adult Patients along with monitoring tool.