

TREATMENT OF HYPOKALAEMIA IN ADULTS

Limitations

There are no national guidelines for the treatment of hypokalaemia, and practice varies widely across UK Hospital Trusts. The dose and route of potassium to correct hypokalaemia must be established on an individual patient basis. This guidance is not suitable for patients with re-feeding syndrome, digoxin toxicity or diabetic ketoacidosis.

The interpretation and application of these guidelines remain the responsibility of the clinician. If in doubt, a senior colleague should be contacted.

Background

Hypokalaemia is a state of electrolyte imbalance in which the serum potassium concentration is less than 3.5mmol/L.

The reference range for potassium concentration vary between laboratories and for the purpose of this guidance, the reference range used is 3.5 - 5.3mmol/L.

Sign and symptoms

Usually dependent on potassium level. Mild hypokalaemia is usually asymptomatic.

- Malaise
- Muscle weakness/ cramps
- Constipation
- ECG changes: U waves, T wave flattening or inversion, ST segment depression
- Respiratory insufficiency
- Paralysis (severe hypokalaemia)
- Rhabdomyolysis (severe hypokalaemia)
- Cardiac arrhythmias especially in patients with ischaemic heart disease, heart failure, left ventricular hypertrophy or on digoxin

Causes

- Decreased potassium intake: starvation, anorexia, alcoholism
- Gastrointestinal losses: diarrhoea, vomiting, ileostomy, intestinal fistulae, excessive use of laxatives
- Increased renal potassium loss
 - Drugs:
 - Thiazide diuretics (e.g. bendroflumethiazide)
 - Loop diuretics (e.g. furosemide)
 - Corticosteroids (e.g. fludrocortisone, hydrocortisone)
 - Aminoglycosides (e.g. gentamicin, amikacin)
 - Amphotericin
 - Laxatives
 - Cisplatin

- High dose penicillins
- Hyperaldosteronism (Conn's syndrome)
- Cushing's syndrome
- Hypomagnesaemia
- Metabolic acidosis
- Transcellular potassium shift
 - Beta-agonists (e.g. salbutamol, terbutaline)
 - Theophylline
 - Insulin
 - Metabolic alkalosis

Severity

Severity of hypokalaemia	Serum potassium concentration (mmol/L)	Potential symptoms
Mild	3.0-3.5	Usually no symptoms, *arrhythmias
Moderate	2.5-2.9	Generalised weakness, lassitude and constipation, *arrhythmias
Severe	<2.5	Muscle weakness and necrosis, *arrhythmias If <2.0, paralysis and impairment of respiratory function
* In patients with ischaemic heart disease, heart failure, or left ventricular hypertrophy, even mild hypokalaemia increases the likelihood of arrhythmias.		

Assessments and Investigations

- Bloods- FBC, U&Es, Magnesium, Bicarbonate, Chloride, Glucose, ECG, Urine electrolytes (potassium and chloride)

Initial Management

- Establish the cause of the hypokalaemia and correct if possible (i.e. review medications and where appropriate stop drugs which may cause hypokalaemia)
- The dose of potassium to correct hypokalaemia should be determined on an individual patient basis
- Concomitant hypomagnesaemia should also be checked and corrected as appropriate because of the strong correlation between hypomagnesaemia and hypokalaemia

SEVERITY OF HYPOKALEMIA	TREATMENT	MONITORING/COMMENTS
MILD K^+ 3.0 - 3.5mmol/L	ORAL REPLACEMENT Sando K[®] tablets: 2 tablets three times a day for 3 days. IV REPLACEMENT (if unable to take orally i.e. nil by mouth, unlikely to absorb oral potassium, unable to tolerate oral administration, severe depletion) 20-40mmol Potassium chloride in 1L of sodium chloride 0.9% over at least 8 hours into a large vein.	Monitor K^+ levels at least twice weekly until stable or >4.5 mmol/L then re-assess Each tablet contains 12mmol of K^+ and 8mmol Cl. Dissolve or mix tablet in water before taking. May be taken with food if preferred. Standard infusion rate: 10mmol/hr Maximum rate of infusion: 20mmol/hour
MODERATE K^+ 2.5 - 2.9mmol/L	ORAL REPLACEMENT Sando K[®] tablets: 2 tablets four times a day for 3 days. IV REPLACEMENT (if unable to take orally i.e. nil by mouth, unlikely to absorb oral potassium, unable to tolerate oral administration, severe depletion) 20-40mmol Potassium chloride in 1L of sodium chloride 0.9% over at least 8 hours into a large vein.	Monitor K^+ levels daily until >2.9 mmol/L then manage as above for mild hypokalaemia. Standard infusion rate: 10mmol/hr Maximum rate of infusion: 20mmol/hour
SEVERE $K^+ < 2.5$ mmol/L	40mmol Potassium chloride in 1L of sodium chloride 0.9% over 6 hours into a large vein.	Maximum rate of infusion: 20mmol/hour ECG Monitoring Monitor K^+ level after each 40mmol (after 6 hours) and adjust treatment accordingly. Repeat infusion if appropriate.

Monitoring

- Monitor serum potassium concentration regularly during IV treatment and oral therapy.
- The rate of administration should not normally exceed 10mmol/hour. Administration rates above 20mmol/hour require cardiac monitoring.
- Administration of potassium at rates faster than recommended may cause cardiac toxicity, including arrhythmias and cardiac arrest.
- Patients receiving digoxin should be monitored closely since hypokalaemia can predispose patient to digitalis toxicity and its arrhythmogenic potential.
- Ensure care is taken in patient already with renal impairment or those receiving drugs such as ACEIs, ARBs, and potassium sparing diuretics in order to avoid overcorrection to hyperkalaemia.
- The presence of life threatening emergency such as serious cardiac arrhythmia or paralysis requires rapid correction.
- Treatment of hypokalaemia may require both potassium and magnesium repletion.
- Consider using premixed infusions that are glucose-free as glucose may cause trans-cellular shift of potassium into cells resulting in a further decrease in plasma potassium concentration.
- Wherever possible commercially available ready to use diluted solutions should be prescribed and used.

References

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