# Intravenous Potassium Chloride Guideline (Adult)-NSRHS

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<td>Summary</td>
<td>Prescription and administration of intravenous potassium chloride</td>
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<td>Author Department</td>
<td>Pharmacy</td>
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Intravenous Potassium Chloride Guideline (Adult)-NSRHS

1. Preamble
Intravenous (IV) potassium chloride is the most frequently administered potassium salt for potassium replacement in the hospital setting. Administration of IV potassium chloride is a potentially dangerous procedure, where errors in calculation, preparation of potassium containing IV solutions or too rapid rate of administration can result in death.(1,2)

IV potassium chloride must be prescribed, administered and handled in a manner that is safe and protects patients from the risks of inadvertent or inappropriate administration of concentrated potassium chloride solutions.

Note: Other IV potassium salts are available for intravenous administration, however their administration is not covered in this guideline. Potassium dihydrogen phosphate is indicated in the management of hypophosphataemia together with hypokalaemia and potassium acetate is used in the preparation of parenteral nutrition (PN).

2. Scope of Practice
All health professionals at Royal North Shore and Ryde Hospitals who are responsible for prescribing, dispensing and administering IV potassium chloride solutions to adult patients including:

- Registered Nurses (RNs) and Registered Midwives (RMs) who have completed the facility’s yearly maths test and intravenous medication test are able to administer IV potassium chloride.

- Enrolled Nurses (ENs) are able to administer the following preparations of IV potassium chloride solution as approved by ward NUM (as per EN’s experience and scope of practice) EN medication administration
  - 30mmol potassium in 0.9% sodium chloride or 5% glucose (1 Litre premixed bag only)
  - 30mmol potassium in 0.18% sodium chloride & 4% glucose (1 Litre premixed bag only)

- An EN can check the RN/RM who is administering IV potassium chloride solution.

3 Guideline

3.1 Table 1: Availability of potassium chloride containing preparations

<table>
<thead>
<tr>
<th>Oral Preparations</th>
<th>Potassium content</th>
<th>Availability: RNSH</th>
<th>Availability: Ryde</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>potassium chloride 600mg slow release (SR) tablets</td>
<td>8mmol potassium / tablet</td>
<td>Pyxis: 6B, 6D, 6E, 6F, 6G, 6H, 7A, 7B, 7D, 7E, 7F, 8B, 8C, 8D</td>
<td>ICU, CCU Emergency (obs) APU (ward 6)</td>
<td>Swallow whole, with plenty of water with / or immediately after food to reduce</td>
</tr>
<tr>
<td>Slow K®</td>
<td>Span K®</td>
<td>8E, 8F, 9A, 9E, ED, Short Stay Surgical</td>
<td>Wards 2, 3, 7 GR4 GR5</td>
<td>GIT side effects. Do not lie down immediately after administration.</td>
</tr>
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</tr>
<tr>
<td>potassium chloride effervescent tablets Chlorvescent®</td>
<td>14 mmol potassium / tablet</td>
<td>Pyxis: 6B, 6D, 6E, 6F, 6G, 6H, 7A, 7B, 7D, 7E, 7F, 8B, 8C, 8D, 8E, 8F, 9A, 9E, ED (Main)</td>
<td>ICU / CCU Emergency (obs) Wards 2, 3, 7 GR4 GR5</td>
<td>Dissolve in one-half to one glass of water (120 to 240 mL)</td>
</tr>
<tr>
<td>Preloaded (premixed) intravenous infusion bags</td>
<td>Preparation</td>
<td>Potassium content</td>
<td>Availability: RNSH</td>
<td>Availability: Ryde</td>
</tr>
<tr>
<td>30mmol potassium chloride in sodium chloride 0.9%; 1000mL (1L)</td>
<td>30mmol potassium in 1000mL Also contains: 154 mmol sodium/L 184 mmol chloride/L</td>
<td>Available via IV stores requisition</td>
<td>Preloaded infusion bags containing potassium must be stored in a separate location, away from other IV infusion bags.</td>
<td></td>
</tr>
<tr>
<td>30mmol potassium chloride in glucose 5%; 1000mL (1L)</td>
<td>30mmol potassium / 1000mL</td>
<td>Available via IV stores requisition</td>
<td>Preloaded infusion bags are to be used wherever possible rather than preparing an IV infusion using ampoules.</td>
<td></td>
</tr>
<tr>
<td>30mmol potassium chloride in sodium chloride 0.18% and glucose 4%; 1000mL (1L)</td>
<td>30mmol potassium / 1000mL Also contains: 30mmol sodium/L 60mmol chloride/L</td>
<td>Available via IV stores requisition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10mmol potassium chloride in sodium chloride 0.29%; 100mL (ISOTONIC)</td>
<td>10mmol potassium in 100mL (ISOTONIC) Also contains in 100mL: 5mmol sodium 15mmol chloride</td>
<td>Pyxis: 6B, 6D, 7A, 7B, 7E, 8B, 8D, 8F, 9A, 9E, ED</td>
<td>After hours cupboard, Emergency (obs) ICU / CCU Theatres</td>
<td>Safe to administer via peripheral line</td>
</tr>
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</table>

Ampoules

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### Preparation

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<thead>
<tr>
<th>Preparation</th>
<th>Potassium content</th>
<th>Availability: RNSH</th>
<th>Availability: Ryde</th>
<th>Note</th>
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<tbody>
<tr>
<td>10mmol potassium chloride; 10mL</td>
<td>10mmol potassium / 10mL (0.75g/10mL)</td>
<td>Pyxis: 6D, 6E, 6F, 6G, 6H, Emergency (paediatric)</td>
<td>ICU / CCU</td>
<td>process must be diluted with a compatible IV solution prior to administration. Other wards requiring ampoules of potassium are to have them dispensed from the Pharmacy. Potassium ampoules are <strong>NOT</strong> to be borrowed from another ward/area. Ampoules <strong>MUST</strong> be stored away from ampoules of sodium chloride 0.9% and water for injection.</td>
</tr>
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</table>

### 3.2 Treatment guideline for adult patients

#### 3.2.1 Potassium physiology

- Potassium is primarily an intracellular cation, only about 2% of total body potassium is extracellular. Correction of these stores takes time with rapid correction of hypokalaemia being potentially harmful. A decrease in serum potassium of 1mmol/L represents a whole body potassium deficit of at least 200mmol (acid-base status dependent). (3,4)
- **Note:** Patients with low serum potassium may also have low serum magnesium. Magnesium levels should be checked and corrected if low. (Refer to Treatment of hypomagnesaemia – draft)

The normal reference range (adult) for serum potassium is 3.5 – 5.0 mmol/L (5)

#### 3.2.2. Mild Hypokalaemia (eg. serum potassium 3.0 – <3.5mmol/L)

In patients who are able to tolerate oral medications and who do not have vomiting or diarrhea, mild hypokalaemia should be corrected with oral potassium supplements such as potassium chloride slow release tablets (8mmol potassium per tablet; Slow-K®, Span K®) or potassium chloride effervescent tablets (14mmol potassium per tablet; Chlorvescent®).

- Where oral potassium cannot be tolerated, preloaded IV solutions containing 30mmol potassium chloride in 1000mL should be used.
• Where fluid management is a problem, the preloaded bags of 10mmol potassium chloride in sodium chloride 100mL ISOTONIC SOLUTION should be used.
• Administration rate should not exceed 10mmol/hour. (6)
• Maximum dose in 24 hours should not exceed 200mmol. (1)

3.2.3 Moderate - Severe /Symptomatic Hypokalaemia (eg. serum potassium < 3.0 mmol/L)

• May be associated with arrhythmias, ileus or muscle weakness. Consequences can be more severe in the presence of other electrolyte disturbances such as hypomagnesaemia, hypercalcaemia, digoxin use and myocardial ischaemia. Where possible, preloaded IV solutions containing 30mmol/L of potassium chloride should be used.
• If the patient is fluid restricted, preloaded 10mmol potassium chloride in sodium chloride 100mL ISOTONIC SOLUTION should be used.
• Most patients can be managed with these two solutions. In the rare circumstance that a more concentrated solution is required, care must be taken to ensure the solution is administered safely, taking into consideration; the line used, rate of administration and monitoring requirements (See 3.6 Administration section below).
• Administration rate should not exceed 20mmol/hour unless the patient is cardiac monitored. (6)
• Maximum dose in 24 hours should not exceed 200mmol. (1)

3.3 Prescribing potassium chloride infusions

• Where possible, standardised intravenous solutions containing potassium should be prescribed ie. preloaded (premixed) IV solutions are preferred to admixtures. (1)
• Prescriptions for preloaded 10mmol potassium chloride in sodium chloride 0.29%100mL bags must clearly state the words “Isotonic solution” or “Isotonic bag” to reduce the risk of staff adding a 10mmol potassium chloride ampoule to a regular 100mL bag of sodium chloride 0.9%.
• IV potassium chloride must be prescribed in millimoles (mmol).
• Abbreviations must not be used (ie do not use “KCl”).
• The rate, route, dilution and administration instructions must be clearly specified. Orders without instructions for dilution and infusion rate must be clarified with prescriber prior to dispensing or administration.
• The recommended rates of potassium administration must not be exceeded (see above).
• Be aware of patients receiving potassium from other fluids such as parenteral nutrition or from potassium phosphate infusions.

3.4 Preparation of non-standard potassium infusions

Addition of concentrated potassium chloride to IV infusion fluid bags has some serious associated risks:

• Errors in calculation of potassium additive
• Inadequate mixing of the solution leading to administration of concentrated potassium solution
• Inadvertent bolus administration of potassium concentrate
• Errors in rate of administration (with high concentrations of potassium, even brief errors in the rate of administration can cause cardiotoxicity).
Infusions of potassium chloride must be prepared according to the guidelines set out in the Australian Injectable Drugs Handbook (copies are available on all wards and also available via CIAP under Medicines Information).

Ampoules containing potassium chloride must be diluted in a suitable volume of compatible fluid. Bags must be thoroughly mixed (ie. inverted at least 10 times) to ensure adequate mixing and prevent pooling of the potassium additive, with consequent inadvertent potassium bolus. (7,8)

Potassium chloride ampoules must NEVER be added directly to burettes (exception ICU only: refer to local ICU protocol)

Potassium chloride ampoules must NEVER be added to preloaded potassium IV bags.

3.5 Labelling

If potassium chloride ampoules are added to an IV bag, the IV bag must be immediately labeled appropriately with a user-applied label (blue label) as per "User applied Labelling of Injectable Medicines, Fluids and Lines"

For all potassium chloride 1000mL infusions (ie. preloaded or prepared), a label stating the date, the time the infusion is commenced and the rate of infusion should be applied.

3.6 Administration

3.6.1 Peripheral line

Intravenous infusions of potassium containing solutions into peripheral veins are often painful. Concentrations greater than 30mmol/L and rates of 20mmol/hour can result in significant patient discomfort. Monitor for phlebitis. In addition to this, intravenous potassium causes significant destruction of superficial blood vessels, necessitating frequent cannula rotations. Monitor for extravasation. Cease infusion immediately if suspected. (6)

Preloaded infusion of 30mmol/L should be used where possible
- Where fluid management is a problem, the preloaded bags of 10mmol potassium chloride in sodium chloride 100mL ISOTONIC SOLUTION should be used. Safe to administer via a peripheral line.
- Concentration of potassium should not exceed 40mmol/L. (6)
- In general, rate should not exceed 10mmol/hour; however higher rates may be required up to maximum of potassium 20mmol/hour for peripheral administration.
- An infusion pump must be used.
- Maximum dose in 24 hours should not exceed 200mmol. (1)

3.6.2 Central Access

- If an infusion of potassium with a concentration of > 40mmol/L is required (and the 10mmol potassium chloride in sodium chloride 100mL ISOTONIC SOLUTION is inappropriate) the solution must be given via a CVAD.
- If concentration of the infusion exceeds 60mmol/L or the rate >20mmol/hour, patients require ECG Monitoring (see table below). Monitoring is not required where 10mmol potassium chloride in sodium chloride 100mL ISOTONIC SOLUTION is used.
- Maximum dose in 24 hours should not exceed 200mmol.

**3.7 Monitoring during replacement**

**3.7.1 ECG Monitoring**

ECG monitoring is required if:
- serum potassium < 3mmol/L and patient is at risk of arrhythmias or major side effects and potassium is required to be administered at > 10mmol/hour.
- Concentration of infusion is > 60mmol/L (except where 10mmol potassium chloride in sodium chloride 100mL ISOTONIC SOLUTION is infused at ≤ 10mmol/hour).
- Rate of infusion is > 20mmol/hour.
- In such cases the patient should be admitted to a ward with a monitored bed (see table below).

Do not attempt rapid correction of hypokalaemia on a general ward using high concentrations or rate of administration of potassium, through either a peripheral vein or central access, without monitoring.

**3.7.2 Monitoring of potassium levels**

If potassium is administered too rapidly or if excretion is impaired, potentially fatal hyperkalaemia can result; it can develop rapidly and asymptotically. Therefore careful monitoring of serum potassium concentration and renal function with dosage adjustment is recommended. (6)

- For potassium replacement in mild hypokalaemia, measure potassium concentrations at least daily.
- For potassium replacement in severe hypokalaemia or when rate >20 mmol/hour, measure potassium concentration every 4-6 hours (blood gas acceptable) or as frequently as clinically indicated.
- Extreme caution is required in administering intravenous potassium to patients with impaired renal function.

**3.7.3 Monitoring of potassium toxicity**

- Signs and symptoms of potential hyperkalaemia should be monitored.
- Such signs and symptoms include:
  - Abdominal pain, bradycardia, confusion, nausea, vomiting, diarrhea, muscle weakness, dysphagia, respiratory distress, peaked T waves on ECG, cardiac arrest.
Table 2: Recommendations for administration and monitoring of intravenous potassium chloride infusions

<table>
<thead>
<tr>
<th>Potassium concentration</th>
<th>Peripheral Line</th>
<th>Central Access</th>
<th>ECG Monitoring Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤40mmol/L (includes 10mmol potassium chloride in sodium chloride 0.29% 100mL ISOTONIC SOLUTION)</td>
<td>≤10mmol/hour</td>
<td>&gt;40mmol/L</td>
<td>&gt;60mmol/L</td>
</tr>
<tr>
<td>&gt;40mmol/L</td>
<td>≤20mmol/hour</td>
<td>&gt;20mmol/hour: ECG monitoring required</td>
<td></td>
</tr>
</tbody>
</table>

Rate of Infusion
- Mild hypokalaemia: ≤10mmol/hour
- Severe hypokalaemia: ≤20mmol/hour
- >20mmol/hour OR >10mmol/hour if serum potassium <3.0mmol/L and patient at risk of arrhythmias or major adverse effects

Administration and monitoring
- An infusion pump must be used when administering IV potassium infusions
- In potassium replacement for severe hypokalaemia or when rate >20 mmol/hour, measure potassium levels at least every 4-6 hours (blood gas acceptable)
- In patients with mild hypokalaemia, measure potassium levels at least daily
- Do not exceed 200mmol in 24 hours

4. Documentation
- The principles of safe medication administration must be observed.
- Documentation of IV potassium orders and administration must be recorded on the IV fluid chart and/or the medication chart.
- IV fluid bags containing potassium must be recorded on the IV fluid chart. The second RN/RM/EN must check the IV fluid together with any calculations and settings of any rate limiting device.
- Prescription of ampoules of potassium chloride must be documented on the medication chart including IV fluid volume and rate of administration (and then administration recorded on IV fluid chart).
- When ampoules of potassium chloride are added to an IV fluid; the ampoule/s, IV fluid, the dose, calculations, any rate limiting device must be checked and countersigned by a second RN/RM/EN.
- The RN/RM/EN checking must also verify the correct patient at the bedside.
- The RN/RM/EN checking all of the above only count signs the medication chart/ fluid chart once, after all of the above has occurred.

5. Education/Training/Dissemination
- The guideline will be distributed to:
  - Medical staff, nursing staff and pharmacists during their orientation
6. References


Bibliography


Hadamay LC. How to safeguard delivery of high-alert I.V. drugs. Nursing 2001; 31(2):36-41.

5. Revision & Approval History

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<tr>
<th>Date</th>
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<td>Pharmacy 9436 31135</td>
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