POLICY FOR THE USE OF POTASSIUM CHLORIDE
(concentrated potassium ampoules and
high strength potassium infusions)

June 2010
<table>
<thead>
<tr>
<th>Title</th>
<th>POLICY FOR THE USE OF POTASSIUM CHLORIDE (concentrated potassium ampoules and high strength potassium infusions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Number</td>
<td>Med10/002</td>
</tr>
</tbody>
</table>
| Implementation Date | First version – July 2003  
Rewritten – June 2010 |
| Review Date | June 2012 |
| Responsible Officer | Medicines Governance Pharmacist, WHSCT |
POLICY FOR THE USE OF POTASSIUM CHLORIDE
(Concentrated potassium ampoules and high strength potassium infusions)

Staff affected by the policy

This policy will generally apply throughout the WHSCT and to all WHSCT medical, nursing and pharmacy staff.

Background / Reason for the Policy

This policy was introduced following a patient safety alert from the National Patient Safety Agency (NPSA) in July 2002, which identified a risk to patients from errors occurring during intravenous administration of potassium solutions.

Objectives of the Policy

- To reduce the risk of accidental overdose of intravenous potassium arising from the use of potassium chloride concentrate solutions.
- To ensure that seriously ill patients in critical care units who urgently require intravenous potassium as part of their treatment can continue to receive it promptly.

Equality and Human Rights Screening

This policy has been screened under the equality legislation (Section 75 of the Northern Ireland Act 1998), targeting social need initiative, disability discrimination and the human rights act 1998. No significant equality implications have been identified. Assessment attached.

Who should have knowledge of this policy?

All medical, nursing and pharmacy staff of all grades must be familiar with this policy.

Responsibilities

All of the above named staff are responsible for ensuring compliance with this policy.

References

1. National Patient Safety Agency (NPSA) Patient Safety Alert – Potassium chloride 23/7/02

Signature

________________________________    ________________  
Chief Executive       Date
### Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>5</td>
</tr>
<tr>
<td>Concentrated potassium ampoules and high strength potassium infusions stocked in WHSCT</td>
<td>5</td>
</tr>
<tr>
<td>Requirements of the NPSA safety alert</td>
<td>5</td>
</tr>
<tr>
<td>Restricted ‘critical care areas’</td>
<td>5</td>
</tr>
<tr>
<td>Ordering and storing potassium</td>
<td>6</td>
</tr>
<tr>
<td>Supply of concentrated potassium ampoules and high strength potassium infusions</td>
<td>6</td>
</tr>
<tr>
<td>Supply of concentrated potassium ampoules and high strength potassium infusions</td>
<td>7</td>
</tr>
<tr>
<td>Range of pre-prepared intravenous potassium solutions</td>
<td>8</td>
</tr>
<tr>
<td>Guidance for staff prescribing / administering potassium</td>
<td>8</td>
</tr>
<tr>
<td>Training guidelines</td>
<td>9</td>
</tr>
<tr>
<td>Monitoring guidelines</td>
<td>9</td>
</tr>
<tr>
<td>Audit policy</td>
<td>9</td>
</tr>
<tr>
<td>References</td>
<td>9</td>
</tr>
<tr>
<td>Appendix A Intravenous potassium infusions available in WHSCT</td>
<td>10</td>
</tr>
<tr>
<td>Appendix B Addition of potassium concentrate ampoules into large volume infusions</td>
<td>11</td>
</tr>
<tr>
<td>Appendix C Flow chart for requesting concentrated potassium ampoules</td>
<td>12</td>
</tr>
<tr>
<td>Appendix D Flow chart for requesting potassium acid phosphate ampoules</td>
<td>13</td>
</tr>
</tbody>
</table>
1. **Introduction**

The National Patient Safety Agency (NPSA) alert\(^1\) relating to intravenous potassium solutions\(^1\) seeks to:

- Reduce the risk of accidental overdose of potassium chloride concentrate and other strong potassium solutions
- Ensure that seriously ill patients in critical care units who urgently require intravenous potassium can continue to receive it promptly

Intravenous potassium is a potentially toxic electrolyte if used inappropriately. It has been responsible for a large number of deaths in hospitals\(^2,3,4\). Problems associated with potassium administration include:

- Excessively rapid infusions.
- Inappropriate bolus injections.
- Inadvertent use as a diluent for drugs in place of sodium chloride 0.9% solution or water for injection.
- Inadequate mixing of potassium when added to infusion bags causing rapid administration of high doses.

<table>
<thead>
<tr>
<th>Table 1: Concentrated amps &amp; high strength potassium infusions stocked in WHSCT (Treated as a controlled drug and stocked in CD cupboard)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concentrated Potassium Solutions (Ampoules)</strong></td>
</tr>
<tr>
<td>Potassium chloride 15% (2mmol / ml, contains 20mmol in 10ml)</td>
</tr>
<tr>
<td>Potassium acid phosphate injection 13.6% (1mmol / ml, contains 10mmol in 10ml)</td>
</tr>
</tbody>
</table>

2. **Requirements of NPSA Alert**

Restricts concentrated potassium chloride ampoules and other high strength potassium infusions to pharmacy and defined critical care areas:

<table>
<thead>
<tr>
<th>Table 2: Designated Critical Care Areas in WHSCT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alt TAGELVIN &amp; ERNE</strong></td>
</tr>
<tr>
<td>Intensive Care Unit (ICU)</td>
</tr>
<tr>
<td>High Dependency Unit (HDU)</td>
</tr>
<tr>
<td>Coronary Care Unit (CCU)</td>
</tr>
<tr>
<td>Neonatal Intensive Care Unit (NNICU)</td>
</tr>
<tr>
<td>Main Theatre Recovery</td>
</tr>
<tr>
<td>Accident &amp; Emergency Department (AED)</td>
</tr>
</tbody>
</table>

- Concentrated potassium ampoules and high strength potassium infusions must be treated as Controlled Drugs.
- Commercially prepared ready to use preparations should be used where possible.
A critical care area **must not** transfer stocks of concentrated potassium ampoules to any other areas; all supplies must be made directly by pharmacy.

In exceptional circumstances a pharmacist may contact a critical care area to authorise a potassium infusion to be prepared and labelled for a non-critical area – see section 4.2 for further guidance:

- Altnagelvin – Adult and paediatric patients will be facilitated by the clinical nurse coordinator (Hospital at Night) preparing the infusion in CCU.
- Erne - clinical nurse coordinator (Hospital at Night) will facilitate any preparation and supply up to 1am. After this time the oncall pharmacist must be contacted.

Potassium acid phosphate **must not** be used for potassium replacement (see appendix D for supply of potassium acid phosphate ampoules). It must only be used if both potassium and phosphate or phosphate only is required - see treatment of hypophosphataemia guidelines on the WHSCT intranet: [http://whsct/IntranetNew/Documents/Treatment%20of%20hypophosphataemia%20in%20adults%20Sept%2020091.PDF](http://whsct/IntranetNew/Documents/Treatment%20of%20hypophosphataemia%20in%20adults%20Sept%2020091.PDF)

### 3. Ordering and storage by critical care wards

Potassium concentrate ampoules and high strength potassium infusions are managed in the same way as Controlled Drugs (CDs):

3.1 Documentation and storage should follow the pattern for CDs.

3.2 A second practitioner must check preparation and administration when using potassium concentrate ampoules and high strength potassium infusions (no exceptions).

3.3 Stock balance of potassium concentrate ampoules must be checked and reconciled as for a CD. Discrepancies must be reported as for a CD.

3.4 Disposal at ward level of unused contents of open ampoules must follow the CD disposal procedure.

3.5 Ampoules no longer required should be returned to pharmacy and should follow the procedure for returning CDs.

3.6 Pre-prepared potassium infusions should be, where possible separated from other infusion fluids.

### 4. Supply of potassium concentrate ampoules and high strength potassium infusions

Potassium concentrate ampoules cannot be transferred between clinical areas.

Non critical care areas may sometimes request concentrated potassium ampoules or high strength infusions. In these circumstances the pharmacist must:

- Confirm there is a genuine clinical need
- Determine whether there is a ready made bag available
- Supply the minimum quantity to fulfil the prescription
4.1 During pharmacy opening hours

- Order direct from pharmacy. Request pharmacy aseptic department to prepare the concentrated potassium infusion. If this is not possible the pharmacist on receipt of an order for concentrated potassium ampoules must deliver the potassium to the requesting ward, bring a copy of the potassium policy and appendix B (guidance on how to add strong potassium to an infusion), clinically check the prescription in line with policy and prescribing guidelines for the treatment of hypokalaemia, sign the potassium into register with nurse. 
- If a non critical area orders concentrated potassium (ampoules or infusion), the supply must be authorised by a pharmacist.

4.2 Outside pharmacy opening hours

Wards must contact the oncall pharmacist. The oncall pharmacist may:

a) Supply a potassium IV infusion from pharmacy or

b) Authorise the transfer of a high strength potassium infusion from a critical care area.

- The oncall pharmacist will contact a critical care area and hospital at night nurse coordinator to authorise a potassium infusion to be prepared and labelled for the non-critical area
  - Altnagelvin - CCU
  - Erne – ICU
- A nurse or doctor from the non-critical area and clinical nurse coordinator (Hospital at Night), on authorisation from the oncall pharmacist must bring the prescription chart to the critical area to prepare and label the infusion with a nurse/doctor from the critical care area.
- The preparation of the infusion is recorded in the CD register of the critical area and the name of the non critical area is recorded beside the patient name in the register.
- The nurse/doctor from the non-critical area and / or clinical nurse coordinator (Hospital at Night) then takes the prepared and labelled infusion to the ward.
- The solution must be recorded in the CD register even in circumstances where immediate use is intended. A new page in the register will be required where a page for receipt of potassium does not exist.
- Storage, for any length of time must be in the CD cupboard. However infusions should ideally commence immediately on return to ward.
- The record should indicate:
  - The date of transfer
  - The critical care area that supplied the potassium infusion
  - The potassium solution received (Potassium ? mmol in ? ml NaCl 0.9% or Glucose 5%)
  - Signatures of the nurses/doctors involved
  - The record of administration can then be made as for any other CD.
- The on-call pharmacist is responsible for ensuring that the clinical area supplied with the potassium infusion is visited by a pharmacist the next working day to review the prescription, the documentation, the infusion, whether it is still running and whether further supplies are required.
c) If the hospital does not have a critical care area (i.e. ward that stocks concentrated potassium ampoules or infusions) or they critical care ward is unable to facilitate the supply:

- The pharmacist will dispense concentrated potassium ampoules
- The pharmacist must deliver the potassium ampoule(s) to the requesting ward
- Bring a copy of the potassium policy and appendix B (guidance on how to add strong potassium to an infusion)
- Clinically check the prescription in line with policy and prescribing guidelines for the treatment of hypokalaemia
- Sign the potassium into register with nurse

5. Range of pre-prepared potassium infusions

- To eliminate the need to add potassium to standard infusion bags in ward areas, a wider range of pre-prepared solutions containing potassium chloride will be made available.
- Wards will only stock routinely used potassium infusions. A list of ready-made infusions containing potassium chloride is available in Appendix A.
- Extra stock of these bags will be available out of hours via the oncall pharmacist.
- Ward / Department managers, pharmacists and pharmacy technicians must regularly review the storage of pre-mixed bags containing potassium chloride in clinical areas. Consideration should be given as to how these solutions can be stored separately from other fluids. Where separate storage is not possible due to limited space, other methods should be explored to highlight the storage of potassium bags. Some areas have used red tape on storage shelves to indicate storage of potassium infusions.

- **Unlicensed bags** – These solutions are unlicensed and as such documentation for ordering, receipt and administration should be completed. The drug and therapeutics committee / medical director / relevant clinical director will sign a form ‘Prescribing unlicensed drugs or using drugs for unlicensed indications’ to allow the agreed critical / non critical care areas to hold stock of unlicensed potassium infusions. All unlicensed potassium infusions are illustrated in the table in appendix A by a green background.

- **High strength potassium infusions (see table 1 page 5)** – These infusions must be treated as controlled drugs and will be stored in the pharmacy controlled drugs room. Wards will also be expected to store these in their controlled drug cupboard.

6. Guidance for Medical Staff prescribing / administering potassium:

- Prescribing guidelines for the treatment of hypokalaemia are on the Trust intranet under the ‘medicines’ icon and then the ‘medicines guidelines’ icon.
- Prescribe **all I.V. potassium** on both the medicines kardex and the fluid balance sheet.
- Monitor fluid balance. Potassium is excreted via the kidneys; therefore a decrease in urine output could increase serum potassium.
- **Do not** use strong potassium as an additive where a commercial, ready to use, preparation is available within the hospital.
- In very exceptional circumstances a Consultant (only) may prescribe potassium infusions in concentrations other than those available for a specific patient (in areas not listed as a critical area for potassium concentrate storage). If appropriate pre-made solutions are not available, requirements may be discussed with Clinical Chemistry or Pharmacy.
- Ensure that a second practitioner always checks for the correct product, dosage, dilution, mixing and labelling during the preparation and administration of solutions prepared from
potassium chloride concentrate and other strong potassium solutions. This second check must include the administration rate.

- Ensure that a second practitioner always checks for correct product, labelling and administration rate for all pre-mixed potassium infusions.
- Ensure that all potassium infusions are administered via a volumetric infusion pump or syringe pump.
- Administer potassium in a sodium chloride-based solution in most circumstances because glucose may cause a further decrease in the plasma potassium concentration due to a shift of potassium into cells.

**Note:**
Potassium Chloride is heavier than sodium chloride and layering may occur when preparing an infusion. Where such layering occurs, the patient is obviously at risk of serious cardiac side effects. Guidance on the making up and mixing of potassium containing solutions can be found in Appendix B.

6. **Training Guidelines**

The WHSCT policy for the use of I.V. potassium solutions will be included in the induction course for all new Trust employees directly dealing with medicines.

- **Nurses:** The administration of parenteral potassium (including relevant theory, professional issues and the Trust policy for the use of IV potassium solutions) will be addressed as part of the intravenous administration of medicines course.

- **Medical Officers:** administering parenteral potassium as part of their practice in designated clinical area are responsible for ensuring that they maintain the necessary skills, knowledge and clinical competence to this area of practice.

- **Pharmacists:** at induction will be trained on the prescribing guidelines for potassium and the expectation that pre-prepared solutions will be used. The training will clarify the use of potassium in the different clinical areas.

7. **Monitoring Guidelines**

In all clinical areas undertaking parenteral supplementation of potassium, there will be a written policy on the frequency of electrolyte monitoring.

8. **Audit of policy**

The policy will be audited on a 2 yearly basis.

**References**

1. National Patient Safety Agency (NPSA) Patient Safety Alert – Potassium chloride 23/7/02
Appendix A: Intravenous potassium infusions available in WHSCT

- Do not prepare potassium infusions in clinical areas when one of these solutions is suitable
- Unless in exceptional circumstances the solutions below should cover the majority of situations

<table>
<thead>
<tr>
<th>Approved Name</th>
<th>Strength / Volume</th>
<th>STOCKED BY:</th>
<th>Suggested Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium 40mmol (0.6%) + NaCl 0.9%</td>
<td>500mL</td>
<td>• •</td>
<td>Fluid restricted patients (Store as a CD)</td>
</tr>
<tr>
<td>Potassium 40mmol (0.3%) + NaCl 0.9%</td>
<td>1L</td>
<td>• • •</td>
<td></td>
</tr>
<tr>
<td>Potassium 20mmol (0.3%) + NaCl 0.9%</td>
<td>500mL</td>
<td>• • •</td>
<td></td>
</tr>
<tr>
<td>Potassium 20mmol (0.15%) + NaCl 0.9%</td>
<td>1L</td>
<td>• • •</td>
<td></td>
</tr>
<tr>
<td>Potassium 10mmol (0.15%) + NaCl 0.9%</td>
<td>500mL</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Potassium 40mmol (0.6%) + glucose 5%</td>
<td>500mL</td>
<td>•</td>
<td>Fluid restricted patients (Store as a CD)</td>
</tr>
<tr>
<td>Potassium 40mmol (0.3%) + glucose 5%</td>
<td>1L</td>
<td>• • •</td>
<td></td>
</tr>
<tr>
<td>Potassium 20mmol (0.3%) + glucose 5%</td>
<td>500mL</td>
<td>• • •</td>
<td></td>
</tr>
<tr>
<td>Potassium 20mmol (0.15%) + glucose 5%</td>
<td>1L</td>
<td>• • •</td>
<td></td>
</tr>
<tr>
<td>Potassium 10mmol (0.15%) + glucose 10%</td>
<td>500mL</td>
<td>• •</td>
<td>Peri-Op management of diabetes</td>
</tr>
<tr>
<td>Potassium 20mmol (0.3%) + NaCl 0.45% + glucose 5%</td>
<td>500mL</td>
<td>• •</td>
<td>Paediatrics</td>
</tr>
<tr>
<td>Potassium 20mmol (0.15%) + NaCl 0.45% + glucose 2.5%</td>
<td>1L</td>
<td>•</td>
<td>Paediatric Surgical diabetics</td>
</tr>
<tr>
<td>Potassium 10mmol (0.15%) + NaCl 0.45% + glucose 5%</td>
<td>500ml</td>
<td>• • •</td>
<td>Paediatric Surgical diabetics</td>
</tr>
<tr>
<td>Potassium 20mmol (0.3%) + NaCl 0.9% + glucose 5%</td>
<td>500ml</td>
<td>• •</td>
<td></td>
</tr>
<tr>
<td>Potassium 10mmol (0.15%) + NaCl 0.9% + glucose 5%</td>
<td>500ml</td>
<td>• •</td>
<td>Paediatrics (DKA)</td>
</tr>
<tr>
<td>Potassium 40mmol (0.3%) + NaCl 0.18% + glucose 4%</td>
<td>1L</td>
<td>•</td>
<td>Stocked by Pharmacy, Erne Hospital only. Issued to ICU on request for adults</td>
</tr>
<tr>
<td>Potassium 20mmol (0.15%) + NaCl 0.18% + glucose 4%</td>
<td>1L</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Potassium 20mmol + Phosphate 10mmol + NaCl 0.9%</td>
<td>500ml</td>
<td></td>
<td>Hypophosphataemia</td>
</tr>
</tbody>
</table>

Unlicensed products
Appendix B: Guidance on how to add concentrated potassium to an infusion

Addition of strong potassium solutions to large volume infusions by a medical officer

1. Preparation must occur immediately prior to use.

2. Strong potassium injection must never be added to an infusion solution that already contains potassium.

3. Strong potassium injection must never be injected into a hanging bag.

4. Hold the additive port uppermost.

5. Inject strong potassium injection downwards into the bag.

6. Invert and agitate the bag repeatedly to mix the contents – squeezing the bag in ineffective.

7. Do not add any other drug to the bag.

8. Label appropriately.

Adapted from Trissell (2001)
Appendix C: Procedure for requesting potassium chloride 15% (20mmol potassium/10ml)

**Critical Care area permitted to stock**
- YES: Supply on receipt of CD requisition
- NO: Can oral potassium be used?
  - YES: Advise prescription to be amended
  - NO: Is volume / diluent / potassium concentration available as a prefilled bag? Check appendix A in potassium policy. Prescribers must use a prefilled bag if available.

**Available from pharmacy contact:**
- Pharmacy or Oncall pharmacist

**Potassium Chloride 15% (20mmol/10ml) may be prescribed on the direction of a consultant (only) and for a specific patient.**

Ensure Prescriber / ward manager has a copy of potassium policy and refer to:
- Prescribing guidelines for the treatment of hypokalaemia in adults & paediatrics
- Appendix B: Addition of potassium chloride concentrate ampoules to infusion bags

Ensure the Potassium Prescription agrees with the infusion recommendations in the potassium policy

Ensure no commercially licensed or unlicensed prefilled bag is available before supplying ampoules

**Working Hours** – Pharmacy must prepare the bag in pharmacy aseptics or supply and deliver the ampoule to the ward and act as a second check in the preparation of the infusion

**On-Call** – Verify the prescription with the hospital at night nurse coordinator.
- Contact the prescriber directly if any doubt. Follow procedure below.
- Critical Care Areas cannot issue concentrated potassium ampoules to non critical care wards.

All potassium infusions must be recorded in the kardex and the fluid balance sheet

**Critical Care Area (CCA) to prepare bag for other ward**
- Confirm with critical care area that a ward requires a potassium containing bag
- Ward / hospital at night nurse to bring prescription to CCA
- Prepare infusion in CCA
- CCA to record supply in register
- Pharmacist must follow up supply the next day

**Concentrated ampoules cannot be transferred to non-critical areas**

**Oncall Pharmacist to supply ampoule to non-critical care area**
- Pharmacist supplies concentrated potassium ampoule from pharmacy
- Pharmacist delivers ampoule to ward
- Receipt of ampoule entered in ward register
- Pharmacist verifies prescription and prepares infusion with nurse/doctor
- Pharmacist must follow up supply the next day
APPENDIX D: Procedure for requesting potassium acid phosphate (1mmol/ml)

- Potassium acid phosphate must not be used for potassium replacement. It must only be used if both potassium and phosphate or phosphate only is required - see treatment of hypophosphataemia guidelines on the WHSCT intranet: [http://whsct/IntranetNew/Documents/Treatment%20of%20hypophosphataemia%20in%20adults%20Sept%2020091.PDF](http://whsct/IntranetNew/Documents/Treatment%20of%20hypophosphataemia%20in%20adults%20Sept%2020091.PDF)

A Consultant must approve the phosphate prescription.

1. Ensure the ward has a copy of the Potassium Policy – Treatment of hypophosphataemia in adults guideline
2. ENSURE THE POTASSIUM PRESCRIPTION AGREES WITH THE INFUSION RECOMMENDATIONS IN THE POTASSIUM POLICY
   - Working Hours - Pharmacist must verify the order and supply as below
   - Out of hours - On-call Pharmacist must follow up the request on the next working day
   All potassium infusions must be recorded on the kardex and the fluid balance sheet.

**Area permitted to stock this preparation?**

- Yes
  - SUPPLY (on receipt of CD requisition)
- No

**Could oral phosphate be used?**

- Yes
  - Advise prescription to be amended
- No

**A Consultant must approve the phosphate prescription.**

**Supply a ready made bag containing 10mmol phosphate and 20mmol potassium in 500ml sodium chloride 0.9% or phosphate polyfusor. Administer according to hypophosphataemia guideline**

**If the volume of ready made infusion (1L over 24 hours) is unsuitable for a fluid restricted patient, contact pharmacy or the on-call pharmacist to arrange preparation of a 20mmol phosphate and 20mmol Potassium in sodium chloride 0.9% or glucose 5%, which should be infused over 24 hours. Potassium Acid Phosphate (10mmol of phosphate and 10mmol of potassium) can be used to prepare this and is stored in the pharmacy controlled drugs cupboard.**

**Critical Care Area to prepare bag for other ward**

- Confirm with critical care area that a ward requires a potassium/phosphate containing bag.
- Ward to bring prescription to CCA
- Prepare infusion in CCA
- CCA to record supply in register
- Pharmacist must follow up supply the next day

**Concentrated amps cannot be transferred to non-critical areas**

**Oncall Pharmacist to supply ampoule to non-critical care area**

- Pharmacist supplies Potassium acid phosphate (1mmol/ml) amp from pharmacy
- Pharmacist delivers ampoule to ward
- Receipt of ampoule entered in ward register
- Pharmacist verifies prescription and prepares infusion with nurse
- Pharmacist must follow up supply the next day