Intravenous Potassium Policy
Edition 3

Prepared by Principal Pharmacist Clinical Governance
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Approved by the Trust Medicines Management Committee
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1. Introduction

Intravenous potassium is a potentially toxic electrolyte, which has been responsible for a large number of deaths in hospitals nationally (1,2,3). Calderdale and Huddersfield NHS Foundation Trust has a responsibility to ensure the safety of patients against hazardous therapy. This policy has been developed to ensure that concentrated potassium solutions and high strength potassium infusions are used both safely and effectively.

Fatalities or serious injury have been reported involving:

- Inappropriate injection of strong potassium chloride 15% (2mmol/mL).
- Potassium added to infusion fluids incorrectly, resulting in pooling at the base of the container and undiluted potassium being administered (4).
- Potassium chloride 15% (2mmol/mL) injected undiluted into a peripheral line due to lack of knowledge (2).
- Potassium chloride 15% (2mmol/mL) accidentally used to reconstitute another drug and administrated (2,3).
- Potassium chloride 15% (2mmol/mL) administration accidentally instead of water for injection or sodium chloride 0.9% injection.

If unlicensed or high strength ready-made potassium infusions are not handled carefully they too pose a further risk:

- Selection errors involving incorrect strength of infusion fluid supplied and administered
- Inappropriate route and rate of administration.

1.1 Scope

This document:

- Outlines the procedures for acquisition, supply, storage, recording, prescribing and administration of concentrated potassium solutions for all areas within Calderdale and Huddersfield NHS Foundation Trust.
- Outlines the procedures for acquisition, supply, storage, recording, prescribing and administration of high strength potassium chloride infusions greater than 40mmol/L for all areas within Calderdale and Huddersfield NHS Foundation Trust.
- It gives good practice guidance in the prescribing, preparation and administration of all intravenous potassium infusions.

It complies with the Patient Safety Alert on Potassium Concentrate Solutions issued by the National Patient Safety Agency 23 July 2002 (Appendix 3).

The policy does not apply to oral preparations containing potassium (e.g. Sando-K).
1.2 **Aim**

- To reduce the risk of inappropriate use of concentrated potassium solutions and other potassium chloride infusions within the Trust.
- To have additional controls on potassium that either must be diluted further before use or those potassium infusions that are recommended to be administered via a central line.
- To enable the regular review and audit of concentrated potassium solutions and high strength potassium infusions used.

1.3 **Definitions**

1.3.1 **Designated Critical Care Areas**

The following are designated Critical Care areas in the Trust as defined in the NPSA Patient Safety Alert on Potassium (Appendix 3).

"Designated Critical Care Areas" are defined as:

<table>
<thead>
<tr>
<th>HRI Site</th>
<th>CRH Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huddersfield Heart Unit</td>
<td>Coronary Care Unit</td>
</tr>
<tr>
<td>Intensive Care Unit</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>Main Theatre</td>
<td>Theatre</td>
</tr>
<tr>
<td>Neonatal Intensive Care Unit</td>
<td>Neonatal Intensive Care Unit</td>
</tr>
</tbody>
</table>

“Designated Critical Care Areas” are permitted to hold concentrated potassium solutions as ‘ward stock’.

1.3.2 **Concentrated potassium solutions**

‘Concentrated potassium solutions’ relate to any solutions defined in the NPSA Patient Safety Alert on Potassium (Appendix 3).

Concentrated Potassium solutions currently held within this Trust:

- Potassium Chloride injection 15% (2mmol/mL)
- Potassium/Sodium Phosphate 2mmol/mL (Addiphos - 40mmol/20mL)
- Potassium Chloride 50mmol/50mL syringes
1.3.3 High strength Potassium infusions

High strength potassium infusions are defined as those with a potassium content of greater than 40mmol/L.

High strength Potassium infusions currently held within this Trust:

- Potassium Chloride 40mmol/100mL in sodium chloride 0.9%
- Potassium Chloride 60mmol/L in sodium chloride 0.9%*
- Potassium Chloride 40mmol/500mL in Sodium Chloride 0.9%*
- Potassium Chloride 40mmol/500mL in Dextrose 5%*

High strength potassium infusions can be kept as ‘ward stock’ in the designated critical care areas, see Appendix 1 for current position.

*One each of the above marked high strength potassium infusions are kept in the out of hours cupboards on the HRI and CRH site.

1.3.4 Formulary Potassium Infusions

All new intravenous potassium products must undergo a risk assessment to determine if they should be included in this policy.

Premixed bags with the potassium content highlighted in red should be purchased where possible.
2. Storage, Supply and Recording of Concentrated Potassium Solutions and high strength of potassium infusions

Concentrated potassium solutions and high strength of potassium infusions will only be kept as routine stock items within pharmacy, and in designated care areas. For details see Appendix 1. The contents of appendix 1 can only be changed with MMC approval.

2.1 Pharmacy Departments

Recording
Controlled Drug documentation must be used to record all receipts and supplies of concentrated potassium solutions and high strength potassium infusions. Specific documentation agreed for use in the Aseptic Dispensing Units must be used to record receipt and supplies.

Storage
Concentrated potassium solutions and high strength potassium bags must be kept in the Controlled Drug Store with the exception of the Pharmacy Aseptic Units. Within the Pharmacy Aseptic Units concentrated potassium solutions must be kept in a designated cupboard/location away from sodium chloride, water for injection and other products of similar appearance.

Supply by Pharmacy During Normal Opening hours

Pharmacy may only supply Concentrated Potassium Solutions or high strength potassium infusions directly to those areas:
- Designated Critical Care Areas as listed in Appendix 1 on production of an order in a Controlled Drug order book.
- Other areas against a Controlled Drug Order for the minimum amount to fulfil a prescription accompanied by the appropriate Drug Prescription and Administration Records.

All requests from clinical areas that are not allowed under the policy to hold ward stock, must receive a clinical check against the patient’s Drug Prescription and Administration Record, from a pharmacist before a supply can be made. The pharmacist must recommend changing the prescription to a ready-made potassium infusion wherever possible. If the pharmacist is satisfied that a supply of concentrated potassium solution is required they will initial the Pharmacy section of the Drug Prescription and Administration Record. Ideally the Pharmacy Aseptic Unit must undertake any additions of potassium concentrate solution to a fluid.

Dispensing Potassium Chloride 15% (2mmol/mL) ampoules
Pharmacy will add the following additional labels to each box of Potassium Chloride 15% (2mmol/mL) ampoules supplied.

< Special Attention> <caution Potassium dilute before use >

A Summary of product characteristics must be issued with any ampoules supplied.
Supply by Pharmacy Outside Normal Opening hours

- A prescription is written for a potassium infusion
- Is it available as a ready-made bag?
  - Yes: Check ward stock list first. If not ‘ward stock’ then check emergency drug list for supplies
  - No: Contact emergency duty pharmacist for advice
- Is the potassium content of the infusion required less than 40mmol/L?
  - Yes: Check ward stock list first. If not ‘ward stock’ then check emergency drug list for supplies
  - No: Contact emergency duty pharmacist for advice

- Staff working in a ‘designated clinical area’ holding stock of potassium concentrated solutions or high strength potassium infusions may only supply to another area following telephone authorisation from a pharmacist.
• In the event that a suitable pre-made bag is unavailable in the clinical area medical staff from the requesting location must contact the emergency duty Pharmacist for advice and supply.

The Pharmacist can then discuss
- The clinical indication, and prescription,
- Method of supply or preparation
- Administration with a member of staff in the requesting ward.
- For high strength potassium infusions consider whether the patient should be nursed in a critical care area where appropriate monitoring and medical support are available.

If a supply of concentrated potassium solutions or high strength potassium infusions is appropriate the pharmacist will arrange a supply of the appropriate ampoules/infusions either:
- Directly from the Pharmacy department, or alternatively.
- By authorising removal of high strength potassium infusions from the emergency cupboard.
- By contacting a senior member of staff on a designated critical care area to authorise the supply of ‘x’ ampoules or infusions for use on the requesting ward.

Supply from the Critical Care Area
The transfer of potassium concentrate solution or high strength potassium infusions will follow that of a Controlled Drugs. (See Section 13 Controlled Drugs of the Medicine Code)

Supply from Pharmacy
A member of staff from the requesting ward must provide the emergency duty pharmacist with the Drug Prescription and Administration Record of the patient and the signed Controlled Drug Order. The pharmacist will then supply the required number of ampoules/infusions and advise on the preparation of the infusion.

Supply of high strength infusion from the emergency cupboard
The site-coordinator must break the seal on the bag containing the high strength potassium infusions and make the necessary entry on the attached sheet:
- Date removed
- Details of infusion removed
- Patient details
- Ward/department details
- Authorised by- name of emergency duty pharmacist.
- Signature and printed name of staff removing

All infusions must be entered in the requesting wards Controlled Drug Register. Supplying area to be stated as ‘Emergency Drug Cupboard’.

An entry that a high strength potassium infusion has been removed for use must also be made on the list of items removed from the emergency cupboard/room.

Action required next working day
• The emergency duty pharmacist must ensure that the dispensary is informed about any requests for potassium infusions the next working day so that they can take the necessary action to replace in the emergency cupboard (fail-safe).

• Either review the prescription them self or ask the ward clinical pharmacist to review. This must include a review of the prescription, documentation system, administration records
and infusion if it is still running. To withdraw any unused potassium chloride concentrate solution or high strength infusions that are no longer required preventing these products being used later inappropriately.

Emergency Cupboard Checks
The daily check of the emergency cupboard/room will include a check to ensure that the seal has not been broken on the bag containing the high strength infusions. If the seal is broken action will be taken to identify by whom and for what purpose with appropriate action, advice and training being provided on the Potassium Policy.

2.2 Designated Critical Care Areas

Designated critical care areas can hold as ward stock concentrated potassium solution and high strength potassium infusions. The ward stock list will reflect the type and quantity of infusions, although only those infusions of 40mmol/L and less will be issued without a Controlled Drug order. The storage and recording in designated critical care areas is as for all clinical areas (section 2.4)

2.3 All Clinical Areas

Ordering
All concentrated potassium solutions and high strength potassium bags must be ordered in a Controlled Drug order book.

Requisitions for ampoules must be for quantities that reflect possible usage.

- Maximum order quantities of concentrated potassium ampoules at one time
  - On NICU 10 ampoules of potassium chloride solution (2mmol/ml)
  - On ICU 10 ampoules of Addiphos

Pharmacy staff may initiate or prompt an order for concentrated potassium solutions, but the order must be signed by a registered nurse authorised to order Controlled Drugs.

Clinical areas other than those designated critical care areas may be asked to order concentrated potassium solutions or high strength infusions only when the pharmacist has confirmed there is genuine clinical need. Ready-made bags routinely stocked by pharmacy are detailed in appendix 2. Concentrated potassium ampoules may only be issued where the use of a ready-made bag is not possible and the Pharmacy Additives Service cannot provide a prepared infusion. Only the minimum quantity to fulfil the prescription can be ordered from pharmacy, using the standard Controlled Drug order book, accompanied by all the patient’s current Drug Prescription and Administration Records.

Recording
Documentation should follow the pattern for Controlled Drugs and should record the requisition, receipt, and administration and destruction of concentrated potassium solutions as detailed in the Trust Medicine Code. In addition, for concentrated potassium solutions ampoules, the record must include details of the potassium infusions prepared.

Storage
Concentrated potassium ampoules (including Addiphos) must be stored in the CD cupboard. Ideally high strength potassium infusions must be kept in the Controlled Drug cupboard or where there is insufficient room a separate designated locked cupboard, away from other infusions and other products of similar appearance, that has been agreed with Pharmacy may be used.
Supply
Clinical areas must not supply concentrated potassium solutions or high strength potassium infusions to other clinical areas unless so directed by a pharmacist. During normal opening hours supplies must be obtained from Pharmacy and outside of these contact the emergency duty pharmacists (See previous section regarding out of normal pharmacy opening hours.)

2.5 Disposal

Pharmacy Departments

Either a Pharmacy Technician or Pharmacist can dispose of the out of date stock of concentrated potassium solutions or high strength potassium infusions in the clinical waste following the guidelines for safe disposal of other injections that are not Controlled Drugs.

A written record of the disposal of the concentrated potassium solutions or high strength potassium infusions must be made in the Controlled Drug register, along with the new stock balance. A witness to the destruction is required. This witness can be either another pharmacist or technician.

The Controlled Drug Register must be retained for 2 years from the date of the last entry and then can be disposed of by shredding.

All Clinical Areas

Follow the guidance given in the Trust Medicine Code for destruction of Controlled Drugs.
3. **Prescribing**

Intravenous potassium infusion is the initial treatment for the correction of severe or symptomatic hypokalaemia, when sufficient potassium cannot be taken by mouth or when absorption is unpredictable. (6)

**Potassium solutions for IV administration should generally be prescribed in those concentrations that are currently available in commercially ready-made diluted infusions.**

Initial potassium therapy should not involve glucose infusions, because glucose may cause a further decrease in the plasma-potassium concentration due to a shift in potassium into cells. (7)

Not all high strength potassium infusions have a product licence. See Policy on Use of Unlicensed Medicines in the Trust.

3.1 **The amount of potassium to be given:**

**Adults**
For dosing in adults see current BNF +/- Injectable Drug Administration Guide. Usual suggested maximum rate is 20mmol potassium per hour. (9) The concentration of potassium should not normally exceed 40mmol/L. Higher concentrations of potassium chloride or faster rates of infusion may be given in very severe depletion, but require specialist advice. (7)

**Neonate & Children**
For dosing in neonates and children see the current BNF for children +/- Medicines for Children.

3.2 **Prescription writing**

The prescription must state:

- Amount of potassium required (mmols)
- The form (e.g. Potassium chloride)
- The diluent to be used
- The total volume to be prepared in
- The period to be infused over or the infusion rate
- The route

3.3 **Monitoring Potassium**

The situation should be monitored by clinical assessment and measurement of plasma potassium concentration and other electrolytes. (6) Adequate urine flow must be ensured. Potassium should not be given in established hyperkalaemia and should be used with extreme caution and close monitoring where there is renal impairment or coincidental administration of drugs that may cause hyperkalaemia.

Repeated measurements of plasma-potassium concentration are necessary to determine whether further infusions are required, and to avoid the development of hyperkalaemia, which is especially likely in renal impairment. (7)
4. Preparation

Commercially prepared ready to use diluted solutions containing potassium should be used where possible.

Where there is a requirement for a potassium solution in a dilution that is not available in a commercially prepared ready to use diluted form, the solution should be prepared in the hospital pharmacy. Preparation of high strength potassium infusions or unusual potassium infusions should only be made at ward level if essential and the Pharmacy Aseptic Dispensing Unit is closed.

Preparation of infusions where need has clearly been demonstrated will be made by pharmacy/medical/nurse practitioners who have received appropriate training, and are assessed as competent to carry it out.

4.1 Dilution

Dilute to the required concentration with Sodium Chloride 0.9% or Glucose 5% or Glucose/Saline. Never add potassium concentrate to an infusion that already contains potassium.

Potassium chloride should normally be diluted by at least 50 times its own volume i.e. 20mmol (10ml) ampoules diluted in 500ml infusion fluid. The usual maximum concentration is 40mmol/L. (8) If exceptionally a more concentrated infusion is needed then the infusion should be given via a central line

Potassium chloride is more dense than the commonly used infusion fluids e.g. sodium chloride 0.9% or glucose 5%. Consequently layering may occur if the solutions are not mixed thoroughly see guidance below.

4.2 Compounding

The following guidelines are provided to ensure that additive drugs are mixed properly and to minimise the risk of pooling, and incomplete distribution of additive (8)

1. The additive port of the infusion bag should be held uppermost.
2. Potassium Chloride injection should be injected downwards into the bag
3. The contents should then be mixed well by inverting the bag at least five times. Repeated squeezing of the bag is not an effective method of mixing and should not be used.
4. Potassium must under NO circumstances be injected into an hanging bag, regardless of whether it is in use or prior to use.
5. Administration

Ideally, concentrations of greater than 40mmol/L should only be given on Critical Care Areas.

5.1 Rate of Infusion

The rate of infusion in adults should not exceed 20mmol/hour (9), although it is usual to infuse it at a slower rate than this with the BNF suggesting 20mmol over 2-3 hours, with specialist advice and ECG monitoring in difficult cases.

5.2 Infusion Device

All continuous intravenous potassium infusions must be administered via a volumetric infusion pump/driver.

5.3 Route of administration

Concentrations of greater than 40mmol/L should ideally be given via a Central Line but this may not be practical or feasible and the prescriber must assess the risks and benefits to the patient on an individual basis. For example, placing a central line may pose a higher risk than infusing 60mmol/L or 80mmol/L solutions into a decent peripheral vein.

5.4 Checking use of Concentrated Potassium solutions in all Clinical Areas

A second practitioner must always check for correct product, dosage, dilution, mixing and labelling during the preparation of or selection of high strength potassium chloride solutions and the actual administration of the potassium infusion including identifying the patient, checking against the prescription, the device for administration and rate of administration.

Any concerns must be addressed to the prescriber or may be discussed with a pharmacist.

5.5 Cardiac Monitoring

Cardiac monitoring must be used in the following circumstances:

- ECG monitoring must be used when the rate exceeds 10-20mmol/hour (9).
- With difficult/complex/at risk patients
- If concentration of potassium infusion exceeds 40mmol/L
5.6 **Acute Events that may accompany administration (9)**

- Administration of potassium concentrations exceeding 40mmol over a period of less than 1 hour poses a serious risk of asystole.

- Pain and phlebitis may occur during peripheral administration of potassium solutions particularly at higher concentrations (more than 30mmol/L of potassium).

- Extravasation may cause tissue damage.

- Potassium Phosphate injection/infusion may cause oedema and hypotension, monitor blood pressure.

- Doses of potassium phosphate exceeding 9mmol/12 hours may cause hypocalcaemia and metastatic calcification, monitor calcium, phosphate, potassium other electrolytes and renal function.
6. Education & Training

Risks associated with storage, prescribing, preparation and administration of concentrated potassium solutions must be highlighted in patient safety induction training for all staff involved in the medication process and emphasised particularly in those directorates where higher strength potassium infusions or non-standard potassium infusions are common, and should also feature in specific training in IV drug preparation and administration. This includes schemes for locum staff.

6.1 Trust Wide

The Calderdale and Huddersfield NHS Foundation Trust Potassium Policy will be included in the Trust Risk Management Mandatory Training course for all new Trust employees.

A copy of the Trust Policy will be available on the Intranet Web-formulary.

6.2 Nurses

The Trust Policy on Potassium must be incorporated into the local induction programme for Registered nurses and ODP’s. The knowledge and skills required will be dependent on the post and should be reflected in the individuals PDR/KSF framework.

The administration of parenteral potassium (including relevant theory, risks associated with the administration, professional issues and the Trusts Concentrated Potassium Policy) will be addressed as part of the Intravenous Administration Study Day

Nurses administering parenteral potassium as part of their practice in clinical areas are responsible for ensuring they maintain the necessary skills, knowledge and clinical competence in relation to there area of practice.

6.3 Medical Staff

Medical staff at induction will be made familiar with prescribing guidelines for parenteral potassium and the expectation that ready made intravenous solutions will be used. Local induction will clarify the use of potassium in the different clinical areas. Where doctors are expected to administer parenteral potassium they will be trained to do so. Junior Doctors will be provided with guidance on electrolyte management.

6.4 Pharmacy Staff

Pharmacy staff at Induction will be made familiar with prescribing guidelines for parenteral potassium and the expectation that ready made intravenous solutions will be used. A copy of the Trust Potassium Policy will be kept in the emergency duty cases.

6.5 Locum/Agency Staff

Locum and agency staff must be given the same access to training as the staff groups listed above.
7. Monitoring of the Potassium Policy

The Potassium Policy will be reviewed every 2 years or earlier in the light of significant new information or further Patient Safety Alerts.

Directorate Pharmacists are responsible for working with clinicians in their area to identify changes in practice with potassium infusions and ensuring that appropriate ready-made bags are promoted and used wherever possible. This may on occasion mean looking into the sourcing of new products and ensuring this Policy is updated appropriately.

Annually they must ensure that the current stock holding of potassium concentrate solutions and high strength potassium infusions are reviewed and appropriate to the ward / department. This must include a review of preparations made in the clinical area or received from Pharmacy and should promote a search for ready-made infusions where appropriate.

An audit of infusions prepared in Pharmacy and in Clinical areas using ampoules of concentrated potassium will be undertaken periodically.
8. References


2. Cousins, D.H. Is it time to make strong KCL a controlled drug? Hospital Pharmacy Practice June 2000


7. BNF 44, British Medical Association & Royal pharmaceutical Society of Great Britain, September 2002


Acknowledgements

Thanks to Other Trusts in the Yorkshire Region for sharing their approach and documentation.
### Appendix 1: Potassium Products by Clinical Area (June 2007)

<table>
<thead>
<tr>
<th>Location</th>
<th>Routine ‘Ward Stock’ of Potassium Preparations</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive Care Unit</td>
<td>Potassium 50mmol/50ml syringes, Potassium Chloride Infusions 40mmol/100mL, Addiphos ampoules, Potassium infusions equal to or less than 40mmol/L</td>
<td>HRI, CRH, CRH</td>
</tr>
<tr>
<td>Neonatal Intensive Care Unit</td>
<td>Potassium Chloride Injection 15% (2mmol/mL), Potassium infusions equal to or less than 40mmol/L</td>
<td>Both</td>
</tr>
<tr>
<td>Theatre/Main Theatre</td>
<td>Potassium Chloride Injection 15% (2mmol/mL), Potassium infusions equal to or less than 40mmol/L</td>
<td>Both</td>
</tr>
<tr>
<td>Coronary Care Unit/Heart Unit</td>
<td>Potassium Chloride Infusions 40mmol/100mL, Potassium infusions equal to or less than 40mmol/L</td>
<td>CRH, Both</td>
</tr>
<tr>
<td>All other clinical care areas</td>
<td>Potassium infusions equal to or less than 40mmol/L</td>
<td>Both</td>
</tr>
</tbody>
</table>

*Please note that in the event of supply problems with potassium infusions/syringes then it may be necessary to provide the designated critical care areas that do not routinely hold potassium ampoules with stock.*
Appendix 2:
Pre-mixed Potassium containing Infusions currently available in the Trust

### Glucose based solutions

<table>
<thead>
<tr>
<th>Potassium Chloride 0.15% and Glucose 5%</th>
<th>Ascribe code</th>
<th>Concentration per container</th>
<th>Container Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL 914C</td>
<td>20mmol</td>
<td>1000ml</td>
<td></td>
</tr>
<tr>
<td>Potassium Chloride 0.2% and Glucose 5%</td>
<td>CAL921C</td>
<td>27mmol</td>
<td>1000ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.3% and Glucose 5%</td>
<td>CAL918C</td>
<td>40mmol</td>
<td>1000ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.6% and Glucose 5%</td>
<td>CAL491A</td>
<td>40mmol</td>
<td>500ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.15% and Glucose 10%</td>
<td>CAL097A</td>
<td>10mmol</td>
<td>500ml</td>
</tr>
</tbody>
</table>

### Sodium Chloride based solutions

<table>
<thead>
<tr>
<th>Potassium Chloride 0.15% and Sodium Chloride 0.9% *</th>
<th>Ascribe code</th>
<th>Concentration per container</th>
<th>Container Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL093A</td>
<td>10mmol</td>
<td>500ml</td>
<td></td>
</tr>
<tr>
<td>Potassium Chloride 0.15% and Sodium Chloride 0.9%</td>
<td>HAC123C</td>
<td>20mmol</td>
<td>1000ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.2% and Sodium Chloride 0.9%</td>
<td>HAC459C</td>
<td>27mmol</td>
<td>1000ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.3% and Sodium Chloride 0.9%</td>
<td>DUX625C</td>
<td>40mmol</td>
<td>1000ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.45% and Sodium Chloride 0.9%</td>
<td>HAC738A</td>
<td>60mmol</td>
<td>1000ml</td>
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<tr>
<td>Potassium Chloride 0.6% and Sodium Chloride 0.9%</td>
<td>HAC029A</td>
<td>40mmol</td>
<td>500ml</td>
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<tr>
<td>Potassium Chloride 3% and Sodium Chloride 0.9%</td>
<td>CAL986D</td>
<td>40mmol</td>
<td>1000ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.15% and Sodium Chloride 0.9% and &amp; Magnesium Chloride 8mmol</td>
<td></td>
<td>20mmol*</td>
<td>1000ml</td>
</tr>
</tbody>
</table>

### Sodium Chloride/Glucose based solutions

<table>
<thead>
<tr>
<th>Potassium Chloride 0.15%, Sodium Chloride 0.18% and Glucose 4%</th>
<th>Ascribe code</th>
<th>Concentration per container</th>
<th>Container Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL916C</td>
<td>10mmol *</td>
<td>500ml</td>
<td></td>
</tr>
<tr>
<td>Potassium Chloride 0.15%, Sodium Chloride 0.18% and Glucose 4%</td>
<td>CAL915C</td>
<td>20mmol</td>
<td>1000ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.2%, Sodium Chloride 0.18% and Glucose 4%</td>
<td>CAL922C</td>
<td>27mmol</td>
<td>1000ml</td>
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<tr>
<td>Potassium Chloride 0.3%, Sodium Chloride 0.18% and Glucose 4%</td>
<td>CAL913C</td>
<td>20mmol *</td>
<td>500ml</td>
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<td>Potassium Chloride 0.3%, Sodium Chloride 0.18% and Glucose 4%</td>
<td>CAL9119C</td>
<td>40mmol</td>
<td>1000ml</td>
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<tr>
<td>Potassium Chloride 0.1%, Sodium Chloride 0.18% and Glucose 10%</td>
<td>HAC405A</td>
<td>6.5mmol</td>
<td>500ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.15%, Sodium Chloride 0.45% and Glucose 2.5%</td>
<td>HAC121C</td>
<td>10mmol*</td>
<td>500ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.15%, Sodium Chloride 0.45% and Glucose 5%</td>
<td>HAC588C</td>
<td>10mmol</td>
<td>500ml</td>
</tr>
<tr>
<td>Potassium Chloride 0.3%, Sodium Chloride 0.45% and Glucose 5%</td>
<td>CAL487A</td>
<td>20mmol</td>
<td>500ml</td>
</tr>
<tr>
<td>Potassium Chloride 8mmol, Sodium Chloride 0.18%, and Calcium Chloride 3mmol</td>
<td>CAL907D</td>
<td>8mmol</td>
<td>500ml</td>
</tr>
<tr>
<td>Potassium Chloride 8mmol, Sodium Chloride 0.18%, and Calcium Chloride 3mmol</td>
<td></td>
<td>8mmol</td>
<td>500ml</td>
</tr>
</tbody>
</table>

### Syringes

<table>
<thead>
<tr>
<th>Potassium Chloride 1mmol/ml</th>
<th>Ascribe code</th>
<th>Concentration per container</th>
<th>Container Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAL030A</td>
<td>50mmol</td>
<td>500ml</td>
<td></td>
</tr>
</tbody>
</table>

### Ampoules

<table>
<thead>
<tr>
<th>Addiphos</th>
<th>Ascribe code</th>
<th>Concentration per container</th>
<th>Container Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAC225D</td>
<td>2mmol/ml</td>
<td>20ml</td>
<td></td>
</tr>
</tbody>
</table>

Ideally shaded item needs infusing through a central line see section 5.3 of Intravenous Potassium Policy Edition 2

Must be diluted before use.
PROBLEM:
Research in UK and elsewhere has identified a risk to patients from errors occurring during intravenous administration of potassium solutions. Potassium chloride concentrate solution can be fatal if given inappropriately.  

National Patient Safety Agency

ACTION FOR NHS BY 31 OCTOBER 2002:
This alert sets out action, including initial action in the following areas:

1. Storage and handling of potassium chloride concentrate and other strong potassium solutions
2. Preparation of dilute solutions containing potassium
3. Prescription of solutions containing potassium
4. Checking use of strong potassium solutions in clinical areas

For the attention of:
Chief Executives of NHS Trusts and Primary Care Trusts

For action by:
Chief Pharmacists and pharmaceutical advisers in NHS Trusts and Primary Care Trusts

For information to:
Regional Directors of Health and Social Care
Chief Executives of Strategic Health Authorities
Directors of Public Health: Regional, StHA, PCT
Medical Directors
Directors of Nursing
Risk Managers
Lead Consultants/Clinical Directors – critical care areas
Communications Leads
Patient Advice and Liaison Service (PALS)  

Date: 23 July 2002
Purpose of this alert

The purpose of this risk alert notice is:

1. to reduce the risk of accidental overdose of intravenous potassium arising from use of potassium chloride concentrate solutions and other strong potassium solutions. (see below for definition of the solutions concerned)

2. 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.

Definitions

Potassium chloride (KCl) concentrate solutions and other strong potassium solutions to which the same precautions should be applied

Solutions of potassium chloride of concentrations
10% (1 gram potassium in 10 mL)
15% (1.5 grams potassium in 10 mL)
20% (1 gram potassium in 5mL)
in ampoules and vials.
Solutions of potassium hydrogen phosphate and potassium dihydrogen phosphate in ampoules and vials.

Critical care areas.
Intensive care units, high dependency care units, cardiac care units, other specialist critical care areas such as renal units, cardiac theatres, neonatal intensive care units and some accident and emergency departments.

ACTION:
For NHS action by 31 October 2002

1. Storage and handling of potassium chloride concentrate and other strong potassium solutions
1.1 Potassium chloride concentrate solutions should be restricted to pharmacy departments and to those critical care areas where the concentrated solutions are needed for urgent use. Potassium chloride concentrate and other strong potassium solutions should be removed from routine stock in wards and clinical departments.
1.2 Potassium chloride concentrate solutions should be stored in a separate locked cupboard away from common diluting solutions such as sodium chloride (normal saline) solution.

1.3 Potassium chloride concentrate solutions should not be transferred between clinical areas. All supplies should be made directly from the pharmacy department. Documentation should follow the pattern for controlled drugs and should record the requisition, supply, receipt and administration of potassium chloride concentrate solution.

2. Preparation of dilute solutions containing potassium
2.1 Commercially prepared ready to use diluted solutions containing potassium should be used wherever possible.

2.2 Where there is a requirement for potassium solution in a dilution which is not available commercially prepared in ready to use diluted form, the solution should be prepared in the hospital pharmacy, wherever possible.

3. Prescription of solutions containing potassium
3.1 Potassium solutions for intravenous administration should generally be prescribed in those concentrations which are currently available as commercially-prepared ready to use diluted solutions.

4. Checking use of strong potassium solutions in clinical areas
4.1 A second practitioner should always check for correct product, dosage dilution, mixing and labelling during the preparation of and again prior to intravenous administration of solutions prepared from potassium chloride concentrate and other strong potassium solutions.

For NHS action by June 2003

5. Training
5.1 Risks associated with the storage, prescribing, preparation and administration of potassium chloride concentrate should be highlighted in patient safety induction training for all staff involved in the medication process and should also feature in specific training in intravenous drug preparation and administration. This includes induction schemes for locum staff.

For further action by National Patient Safety Agency (NPSA) by April 2003
6.1 The NPSA will commission an audit to determine the use of potassium chloride concentrate and ready to use diluted solutions containing potassium within the NHS. This audit will identify the range of ready to use dilutions necessary to meet the full range of clinical needs.
6.2 NPSA will work with NHS Purchasing and Supply Agency, the Medicines Control Agency and the pharmaceutical industry to facilitate the manufacture and supply of an appropriate range of ready to use solutions to minimise the need for potassium chloride concentrate ampoules and vials in clinical areas.

6.3 NPSA will work with practitioners, the Medicines Control Agency and the pharmaceutical industry to determine the best method to ensure easy identification of potassium chloride concentrate and other strong potassium solutions and to implement distinctive standardised labelling and packaging of these products.