

Safe Handling of Intravenous Potassium Chloride in Health Care Facilities - Policy

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Summary Details safety controls for the intravenous (IV) potassium chloride and other concentrated potassium salts.

Author Branch Quality and Safety

Branch contact Dr C Pain 9391 9558

Applies to Area Health Services/Chief Executive Governed Statutory Health Corporation, Board Governed Statutory Health Corporations, Affiliated Health Organisations, Government Medical Officers, NSW Ambulance Service, NSW Dept of Health, Private Hospitals and Day Procedure Centres, Private Nursing Homes, Public Hospitals

Distributed to Public Health System, Government Medical Officers, NSW Ambulance Service, NSW Department of Health, Public Hospitals, Private Hospitals and Day Procedure Centres, Private Nursing Homes, Tertiary Education Institutes

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Director-General

Compliance with this policy directive is mandatory.

CIRCULAR

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Contact	Dr C Pain (02) 9391 9569 Quality and Safety Branch

**Policy for the Safe Handling of
Intravenous Potassium Chloride in Health Care Facilities**

This circular is to be read in conjunction with Circular 2001/64, *Policy on the Handling of Medication in New South Wales Public Hospitals*, in particular sections 5.1.8, 6.1.1 and 6.1.4.

The Medication Safety Taskforce of the Australian Council for Safety and Quality in Health Care has issued the attached Medication Alert 1, *Intravenous POTASSIUM CHLORIDE can be fatal if given inappropriately*.

This is the first alert to be prepared by the Taskforce to provide information on high risk medications that have the potential to cause serious or catastrophic harm to patients. This alert is provided for the attention of relevant area health service personnel, including pharmacists, medical officers, nurses and supply personnel.

All facilities are to immediately commence implementation of the safety controls for intravenous (IV) potassium chloride and other concentrated potassium salts detailed in the attached Alert.

Three types of error associated with the preparation and administration of intravenous potassium chloride have been identified routinely. These include:

- ◆ Wrong ampoule (eg potassium chloride ampoule selected instead of sodium chloride 0.9% due to similar appearance)
- ◆ Cognitive mixup (familiar pairing of potassium chloride with another drug, such as frusemide)
- ◆ Preparation error (incorrect preparation of an IV infusion of potassium chloride)

The availability of potassium chloride ampoules as stock in ward areas has been identified as the common root cause of these errors. Potassium chloride ampoules are to be removed from ward stock and replaced with standard premixed solutions for intravenous infusion, wherever possible. Ampoules of other concentrated potassium salts (eg potassium dihydrogen phosphate) should also be removed from ward stock.

Distributed in accordance with circular list(s):

A 5	B	C 5	D	E 2	73 Miller Street North Sydney NSW 2060
F	G	H 5	I	J 3	Locked Mail Bag 961 North Sydney NSW 2059
K	L 2	M 1	N	P 2	Telephone (02) 9391 9000 Facsimile (02) 9391 9101

In accordance with the provisions incorporated in the Accounts and Audit Determination, the Board of Directors, Chief Executive Officers and their equivalents, within a public health organisation, shall be held responsible for ensuring the observance of Departmental policy (including circulars and procedure manuals) as issued by the Minister and the Director-General of the Department of Health.

Implementation Strategy

Aim

To facilitate the introduction of procedures to reduce the risks associated with administration of potassium chloride and other intravenous potassium salts in the NSW health system.

Local Policy

Local policies and procedures are to be developed for the handling of potassium chloride and other concentrated potassium salts based on Circular 2001/64 and the Safety and Quality Council alert. As stated in the circular, full terminology ie potassium chloride is to be used at all times in the policy, procedures and any other documentation, rather than abbreviations. These policies and procedures are to be approved by the Drug Committee and effectively communicated throughout the hospital.

Multidisciplinary Team

A multidisciplinary team is to be formed to action the recommendations in the Alert. This team is to review current practice, develop an implementation strategy and evaluate progress and outcomes.

Review of practice.

A review of practices is to be undertaken of procurement, distribution, storage, prescribing, preparation and administration, education and training and monitoring of potassium solutions. A range of assessment tools may be used such as risk assessments, incident reports, and types of products available as stock and competency assessments.

Implementation Strategy

The implementation strategy must include approval of the procedures/guidelines, change over of products, education and training and development of a monitoring system.

Evaluation

Progress is to be monitored by the multidisciplinary team through an audit of the systems that have been put into place in March, June and December 2004. Compliance with this circular will be a mandatory audit item in the Patient Safety Audit, Inspection and Improvement Program.

Robyn Kruk

Director-General

MEDICATION ALERT!

From the Medication Safety Taskforce of the Australian Council for Safety and Quality in Health Care

The purpose of this alert is to provide frontline health professionals and administrators with information on high risk medications that have the potential to cause serious or catastrophic harm to patients. The intention is to raise awareness of the potential harm and provide a strategy for local level response.

Alert 1, October 2003

Intravenous **POTASSIUM CHLORIDE** can be fatal if given inappropriately

For the attention of *Chief Executive Officers*
and *Directors of Nursing, Pharmacy, and Medical Services; Doctors, Nurses and Pharmacists*

For implementation immediately

Wrong ampoule (Australia)

A patient indicated that the cannula site in her hand was becoming painful. An ampoule of normal saline was selected from the medication cupboard in order to flush the cannula site. The patient quickly became distressed and stopped breathing within a few minutes. The ampoule that was thought to be normal saline was actually potassium chloride. The patient could not be resuscitated.¹

Preparation error (Australia)

Two ampoules each containing 10 millimoles of potassium chloride were added directly to a running large-volume parenteral fluid without mixing. The patient received a bolus dose of potassium chloride and had a cardiac arrest.²

Overseas Experience

The risks associated with intravenous potassium chloride are well known. It has been identified as the drug most commonly implicated in fatal incidents in acute care facilities. This alert is based on similar recommendations from the UK³, USA⁴ & Canada⁵.

Tools and Tips

Tools to action this alert can be found on the Council website at www.safetyandquality.org

Critical incidents have been associated with the preparation and administration of intravenous (IV) potassium chloride indicating that patients are at risk. **Ampoules of potassium chloride must be diluted before use.**

Three types of error have been identified routinely⁵

- **Wrong ampoule**

Potassium chloride ampoules are mistaken for ampoules of similar appearance, such as sodium chloride 0.9% (normal saline) when reconstituting a drug for injection. Consequently, the patient is administered an accidental overdose of potassium.

- **Cognitive mix-up**

The intent is to select frusemide (a diuretic), but a potassium chloride ampoule is selected by mistake and administered. This type of cognitive error is thought to arise due to the frequent use of potassium chloride in patients who are taking frusemide; conditioning staff to the familiar pairing of the two drugs.

- **Preparation error**

An intravenous infusion of potassium chloride is prepared incorrectly.

Errors have a single common cause

Incidents have a common root cause—potassium chloride ampoules are available as medication stock in wards and other patient care areas.

Recommendations

1. **REMOVE AMPOULES OF POTASSIUM CHLORIDE FROM WARD STOCK AND REPLACE WITH PREMIXED SOLUTIONS.**

Due to the risk associated with intravenous potassium chloride, ampoules of potassium chloride SHOULD NOT be kept as a stock item in wards.

2. In critical areas where high concentrations and doses of potassium chloride are necessary, do a risk assessment to determine whether it is appropriate to keep the ampoules as a stock item and develop a protocol for safe preparation and use.

3. Assess the storage of potassium chloride ampoules and premixed solutions to ensure they are stored separately and are readily identifiable from preparations with similar packaging.

The recommendations also apply to ampoules of potassium phosphate or other concentrated potassium salts.

ACTION

Successful implementation of the actions below requires the commitment of personnel from all clinical areas.

Many acute care facilities have already implemented safety controls for IV potassium chloride in their institution—it is recommended that all facilities evaluate their current safety controls for IV potassium chloride against the actions recommended below.

CHIEF EXECUTIVE OFFICERS

1. Form and resource a multidisciplinary team to action the recommendations in this alert, and review and evaluate progress (see review and evaluation below). Team members would include representatives from the Drug and Therapeutics Committee, the Risk Management Department or Quality Department, and patient care teams.
2. The team should be given a mandate to reduce the error potential of potassium chloride and define an implementation strategy (including timelines). The team should provide regular updates to the CEO and/or the appropriate hospital committee outlining progress toward preventing incidents with intravenous potassium chloride.

DRUG AND THERAPEUTICS COMMITTEES

3. Develop clear therapeutic guidelines for the use of potassium chloride. Sample guidelines are available on the S&Q Council website. Guidelines should include the following points:
 - 3.1 Oral, instead of IV potassium chloride should be used for the treatment of hypokalemia whenever clinically feasible.
 - 3.2 Prescribing of all IV potassium chloride should be in millimoles (mmol).
 - 3.3 Prescribing and use of standardised premixed solutions containing potassium chloride should be encouraged.
 - 3.4 Provide a clear definition of the maximum concentration of potassium chloride allowable in an IV solution.
 - 3.5 Specify the maximum hourly rate and daily limits of potassium chloride that a patient may receive (by central or peripheral lines); and recommended infusion rate, infusion pump requirements, and patient monitoring.
4. Once the guidelines describing safe administration of potassium chloride are approved, ensure that they are readily available and accessible in all wards. Review regularly. Consider developing summary charts of key messages for ready reference; see the S&Q Council website for examples.
5. Review the concentrations of potassium chloride ampoules and premixed solutions available hospital-wide. Consider rationalising the range of concentrations (eg only stock the '10 mmol in 10 mL' ampoules).

DIRECTORS OF MEDICAL SERVICES, PHARMACY AND NURSING

Where commercially prepared premixed potassium chloride infusions are available, these products should be procured and introduced, and IV potassium chloride ampoules withdrawn from use. Where this is not feasible, safe on-site preparation and administration protocols should be developed.

6. Undertake a specific multidisciplinary review (by doctors, nurses, and pharmacists) in each ward, department, and clinic with the following aims.
 - 6.1 Identify if potassium chloride ampoules are available. Identify any barriers to the removal of the ampoules. If no barriers exist, remove all potassium chloride ampoules from the area and replace with premixed solutions. In critical areas where potassium chloride ampoules are to be retained, a risk management policy should be developed and staff education on strategies to minimise risk should be undertaken.
 - 6.2 Ensure that appropriate concentrations of premixed IV solutions are available in adequate quantities in wards.
 - 6.3 Ensure prescribing practices are standardised to match the available premixed solutions.

PHARMACISTS

7. Evaluate practices for storing IV potassium chloride preparations in the pharmacy and on wards to reduce the likelihood of substitution errors.
8. Assess the range of premixed potassium chloride solutions available and ensure adequate supply for each area.
9. *Where facilities and staff are available*, have the pharmacy aseptic dispensing service prepare premixed potassium chloride products that are not available commercially. Otherwise, follow the protocol for safe on-site preparation.

NURSES

10. Prescriptions with directions such as “KCl 20 mmol IV now” or “give KCl 10 mmol IV bolus” should be considered incomplete and unacceptable. Orders without instructions for dilution and infusion rate should not be accepted. The word “bolus” should never be used for IV potassium chloride solution orders.
11. Consider instituting a double-check policy for administration of IV potassium chloride—have two practitioners check the correct product, dose, dilution, labelling, route and rate before administration, as per the safe on-site preparation protocol.
12. Consider adding auxiliary fluorescent warning labels to IV potassium chloride preparations.
13. Question any nonstandard order for an IV solution with potassium chloride.
14. *Where facilities and staff are available*, advocate having the pharmacy prepare any nonstandard solutions that are deemed necessary but are unavailable in a premixed form.
15. When the above options are not available, keep potassium chloride ampoules on the ward in a medicine cupboard (preferably locked) and store separately from other ampoules with similar appearance.

DOCTORS

16. Standardise prescribing of IV potassium chloride—prescribe in millimoles rather than 'milligrams per litre' or 'percent'.
17. Ensure orders for IV potassium chloride have rate, route, dilution and administration instructions fully specified.
18. Prescribe premixed (standard concentration) potassium chloride infusions where possible.

TRAINING

19. Include the issue of potassium chloride injury and preventive system safeguards as an item for discussion during orientation programs for nurses, doctors, and pharmacists, and as part of continuing education training.

REVIEW AND EVALUATION AT FACILITY LEVEL

Resources must be made available to evaluate progress at an appropriate time, eg after 6 months. For example:

- *Are premixed solutions being used?* Audit the distribution of potassium chloride ampoules & premixed solutions pre and post system change.
- *Are doctors prescribing, and nurses administering premixed solutions? If not, why not?* Communicate with staff.
- *Are doctors prescribing in millimoles? Are orders complete?* Evaluate prescribing.
- *Are 'near miss' incidents relating to IV potassium chloride reported and assessed?* Communicate with staff.
- *Are ampoules or premixed solutions being transferred between clinical areas?* Assess protocols.
- *Which areas have retained potassium chloride ampoules, and why?* Assess safety controls in these areas.
- *To what extent are non-standard IV potassium solutions (ie solutions not available as commercially prepared premixes) being used? How and where are they prepared?* Assess the range of products available.
- Have regular meetings and monitor progress. Survey staff regarding knowledge of policies and guidelines.
- Comment on this alert system, your experience in implementation and share your knowledge and tools via the feedback form on the S&Q Council website.

FURTHER INFORMATION

Kathryn Bollen
Medication Safety Taskforce
Australian Council for Safety and Quality in Health Care
MDP 46
GPO Box 9848
Canberra ACT 2601
Phone: +61 2 6289 4244 Fax: +61 2 6289 8470
Email: medalerts@health.gov.au
Website: www.safetyandquality.org

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