AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

Please note that the following document was created by the former Australian Council for Safety and Quality in Health Care. The former Council ceased its activities on 31 December 2005 and the Australian Commission for Safety and Quality in Health Care assumed responsibility for many of the former Council's documents and initiatives. Therefore contact details for the former Council listed within the attached document are no longer valid.

The Australian Commission on Safety and Quality in Health Care can be contacted through its website at http://www.safetyandquality.gov.au/ or by email mail@safetyandquality.gov.au

Note that the following document is copyright, details of which are provided on the next page.

AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

The Australian Commission for Safety and Quality in Health Care was established in January 2006. It does not print, nor make available printed copies of, former Council publications. It does, however, encourage not for profit reproduction of former Council documents available on its website.

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.

Safety+Quality COUNCIL
www.safetyandquality.org

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 UK[3], USA[4] & Canada[5].

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 routinely[5]

- **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

References

1. Case report supplied courtesy of the Monash University National Centre for Coronial Information (MUNCCI)
2. Case report – personal communication P. Thornton
3. National Patient Safety Agency. 2002. Patient Safety Alert. Accessed: 2/7/03. www.npsa.nhs.uk/alerts/allAlertsView.asp
4. JCAHO. 1998. Sentinel Event Alert. Accessed: 03/07/03 www.jcaho.org
5. U D, Hyland S. Medication safety alerts. 2002 CJHP 55 (4) 278-280

The Australian Council for Safety and Quality in Health Care thanks the following organisations and government agencies for their input and/or dissemination of this alert notice: ACHSE, ADRAC, ADSA, AHA, AIMS, AMA, ANF, APHA, CHA, CHF, Commonwealth DoHA, HPCA, Medicines Australia, MUNCCI, NPS, NSWTAG, NTD&TC, PGA, PHIQS, PSA, QHDAC, RACMA, RACP, RACS, RCNA, SATAG, SHPA, S&Q State and Territory Quality Officials Forum, TSTDC, VicTAG, WADTC.