Medication Safety Alerts

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This column draws on US and Canadian experience and may include, with permission, material from the *ISMP Medication Safety Alert!*, a biweekly bulletin published by the Institute for Safe Medication Practices (ISMP), Huntingdon Valley, Pennsylvania.

PHARMACISTS' ROLE IN PREVENTING MEDICATION ERRORS WITH POTASSIUM CHLORIDE

A recently announced coroner's inquest will review the case of Frances Marie Tanner, who died in an Ontario hospital on January 21, 2002, as a result of accidental injection of concentrated potassium chloride. As health care professionals, we are spurred to action to take steps to prevent future tragedies of this nature. On the basis of previous documentation of cases of error-induced injury with potassium chloride and the resultant recommendations,[1-6] we can anticipate the system remedies that will be highlighted in the upcoming inquest. There is thus no need to await the outcome of the inquest — we can start to implement more safeguards in our medication-use systems today, to prevent mishaps with potassium chloride.

Successful implementation of system changes to prevent error-induced injury with potassium chloride entails multidisciplinary commitment. Pharmacists are in a position to lead the way, and, if initiatives are already in place in a hospital, they are in a position to move these measures forward, to ensure implementation to the fullest extent possible. Michael Cohen, a pharmacist in the United States, has long advocated for changes in the manner in which potassium chloride products are stored and dispensed (and manufactured), and his writings provide guidance and direction.[3-6]

ISMP Canada is aware of several Canadian hospitals that have implemented strategies to prevent injury with potassium chloride. These examples of system redesign demonstrate a movement toward a culture of patient safety. We hope that the suggestions below will serve as a useful checklist for system improvements to prevent injury with potassium chloride in your institution.

1. If your hospital has not already done so, pull together a high-level multidisciplinary team that can forward recommendations to the Medical Advisory Committee and help move hospital-wide patient safety initiatives forward promptly. Representatives from the Pharmacy and Therapeutics Committee, the Risk Management Department, the Quality Department, and the patient care teams are suggested starting points for identifying team members. The team should develop a mandate to reduce the error potential of potassium chloride, define an implementation strategy (including timelines), and provide regular updates to the hospital board's Quality Committee, outlining progress toward preventing tragic accidents with concentrated potassium chloride.
2. Recommend that each patient care unit, program, department, and clinic undertake a specific multidisciplinary review (by physicians, nurses, and pharmacists) with the following aims:
   (a) Identify if potassium chloride concentrate is ever available in the respective patient care area and, if so, under what circumstances.
   (b) Identify any barriers to the complete removal of potassium chloride concentrate from the patient care area. If no barriers exist, remove all potassium chloride concentrate from the patient care area. Storage of potassium chloride concentrate in patient care areas, automated dispensing units, and emergency (crash) carts should be discouraged.

(c) Ensure that standardized premixed IV solutions incorporating potassium chloride are available in adequate quantities in the medication rooms.
(d) Ensure that prescribing practices are standardized to match the available premixed solutions containing potassium chloride.

3. Recommend that the Pharmacy and Therapeutics Committee develop clear guidelines for the use of potassium chloride. Such guidelines should address the use of oral potassium instead of IV potassium for the treatment of hypokalemia whenever clinically feasible; the prescribing of standardized solutions containing potassium chloride; the clear definition of the maximum concentration of potassium chloride allowable in an IV solution; the recommended maximum hourly and daily limits of potassium chloride that a patient may receive; and 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 patient care areas.
5. Consider removing the 20 mEq/10 mL size of potassium chloride concentrate from the hospital drug inventory. The 40 mEq/20 mL size concentrate has a different "look and feel" from other products, such as 10 mL sterile water and 10 mL sodium chloride, which have so often been confused with potassium chloride. This measure can help staff to differentiate between these products.
6. Consider adding an auxiliary fluorescent warning label to the potassium chloride concentrate product, which would read as follows:

** CAUTION **
Concentrated KCl
Fatal if Injected Undiluted
DILUTE before use

Ideally, the label would be added at the time of receipt of the drug into inventory, before it is placed on the shelf in the pharmacy.

7. If your hospital is purchasing premixed minibags containing potassium chloride, consider adding an auxiliary warning label to these products as well. The warning label on the minibag products should provide instructions as to the recommended route of administration (e.g., "central line only") and the recommended duration of infusion (e.g., "Infuse over at least 1 hour"). Minibag products containing potassium chloride should be dispensed and controlled by the pharmacy department rather than through a stores or central supply department, to help prevent confusion with other minibag products.
8. Advocate for pharmacist intervention whenever a nonstandard order for an IV solution with potassium chloride is prescribed. Intervening on all nonstandard orders can be an opportunity to educate physicians and nurses about system improvements for patient safety and will help to engender a culture of safety. Several hospitals have implemented automatic substitution policies for nonstandard orders. Other hospitals have opted for direct communication as the method of order intervention. Prescribing practices must take into consideration the premixed IV solutions containing potassium chloride that are available.
9. Orders such as "KCl 40 mEq IV now" or "give KCl 20 mEq 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. These are examples of opportunities to educate about prescribing with safety in mind.
10. Advocate having the pharmacy prepare any nonstandard solutions that are deemed necessary but are unavailable commercially in a premixed format. This measure would include reviewing dialysis solutions requiring the addition of potassium chloride.
11. Evaluate practices for storing potassium chloride in the pharmacy. Choose a designated area for storage of this drug to reduce the likelihood of substitution errors.
12. Recommend that the issue of potassium chloride injury and preventive system safeguards be included as an item for discussion during orientation programs for nurses, physicians, and pharmacists. The video *Beyond Blame*, which can be obtained through Bridge Medical (http://www.mederrors.com), can be a powerful communication tool for effecting system improvements.

The suggestions listed above emphasize the shared responsibility of multidisciplinary professionals to ensure the safe storage and use of potassium chloride. Pharmacists are in a position to identify the system weaknesses that could result in patient injury, and they have a key role in the development of potassium chloride error-prevention strategies. Pharmacists have the knowledge, the experience, and, in most Canadian hospitals, the influence to ensure that medication safety initiatives are defined and implemented. Although many

pharmacists are aware of the concerns and risks related to potassium chloride products, leadership and action are needed to ensure that the necessary changes are made. We are confident that many pharmacists are willing to take up this challenge and are determined to make safe medication practices a high priority when providing pharmaceutical care to Canadian patients.

To accomplish all of the suggested strategies for system improvements, some changes in pharmacy services, and a review of priorities and resources, may be necessary. Additional resources may be required for strategies such as in-house preparation of selected potassium chloride solutions and possibly a 24-hour on-call service for unexpected situations. The purchase of commercially available premixed solutions containing potassium chloride may have cost implications. Ultimately, specific persons or groups must take responsibility and be accountable for the decisions required to prevent accidents with potassium chloride, as well as for decisions to weigh the risks and benefits if potassium chloride concentrate remains accessible in patient care areas. Senior management must be advised of the risks associated with potassium chloride concentrate, the financial considerations associated with improving safety, and the potential impact of not implementing system improvements.

Pharmacists are encouraged to inform the manufacturer when look-alike and sound-alike product packaging and labelling problems are identified. Manufacturers are not always aware of front-line experiences with their products, and educating manufacturers about product problems will help to improve our health care system.

Finally, pharmacists, in conjunction with the hospital's Product Evaluation and Pharmacy and Therapeutics Committees, must invest time in performing failure mode and effects analysis (FMEA) on existing potassium chloride products, as well as for other products considered for purchase in the future. The concept of FMEA was first introduced in the engineering literature in the early 1960s, and it is now recognized as a good method to proactively identify the risks and potential patient injuries associated with existing or new pharmaceutical products. The following questions are asked in this type of analysis: What could fail and how? Given the various possibilities for failure, what are the potential consequences of each? More information about FMEA and how it relates to medication safety can be found in the textbook *Medication Errors*.[7] In addition, ISMP Canada recently published a Safety Bulletin entitled "How to use 'failure mode and effects analysis' to prevent error-induced injury with potassium chloride."[8] The bulletin briefly describes reports of sentinel events and near-miss incidents with potassium chloride that have been reported to ISMP Canada during the past 2 years. A copy of this bulletin can be obtained by request to info@ismp-canada.org.

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Additional Reading

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