

## Announcements

In accordance with our national mandate, ISMP Canada is now in the process of translating our website and bulletins into the French language in order to provide medication safety support services to French speaking practitioners and hospitals. We are pleased to have retained Marie-Claude Poulin of Montreal University Health Centre - Centre Hospitalier de l'Université de Montréal (CHUM), who will assist us with related projects. Marie-Claude is a hospital pharmacist and currently serves as the risk management advisor to CHUM. ISMP Canada has a collaborative agreement with CHUM for mutual support in patient safety initiatives.

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The Canadian Council on Health Services Accreditation (CCHSA) has recently expanded its scope on patient safety activities. There is a newly created Patient Safety Advisory Committee with ISMP Canada as a member along with other key stakeholders. There are plans to revise the standards related to medication use, identify medication safety indicators and propose specific patient safety goals for Canadian hospitals.

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The British Columbia Patient Safety Task Force, under the auspices of the BC Ministry of Health, has recently invited ISMP Canada into a patient safety collaborative. Like hospitals in the provinces of Ontario, Manitoba, Saskatchewan and Nova Scotia, hospitals in British Columbia will have the option of participating in the Medication Safety Self-Assessment<sup>®</sup> program. Healthcare facilities and staff will also receive the ISMP (US) Medication Safety Alert! and the ISMP Canada Safety Bulletin.

## High Alert Drugs and Infusion Pumps: Extra Precautions Required

Health Canada recently issued a Notice to Hospitals on "Health Risks Associated with the use of INFUSION PUMPS".<sup>1</sup> The notice discussed reports of pump problems including general purpose, enteral, insulin, and patient-controlled analgesia (PCA) pumps. Of the 425 incidents reported, 23 resulted in patient death, 135 in injury, and an additional 127 could potentially have led to death or injury. Recommendations made by Health Canada focused on pump safety design features including free-flow protection and ergonomics, as well as staff education and training.

ISMP Canada has published two recent bulletins describing errors with infusion pumps.<sup>2,3</sup> The bulletins identified pump design as a significant factor contributing to the adverse drug events reported. However, in addition to the need for improved pump designs, reported errors with infusion pumps also suggest the need for procedural safeguards. The infusion pump project undertaken by the National Patient Safety Agency (NPSA) in the United Kingdom reviewed over 6,770 incident reports of infusion and transfusion events reported over a 10-year period.<sup>4</sup> For 53% of incidents no fault or "cause" could be found with the infusion device, 19% of incidents were attributed to user error. This prompted NPSA to focus their suggested solutions on workplace systems. Four proposed solutions direct efforts towards (i) a checklist for the purchasing process, (ii) evaluation of device usability; (iii) infusion pump management, and (iv) user training and competence assessment.

ISMP Canada recently received three error reports involving high alert<sup>5</sup> medications administered with infusion pumps. The first case involved an error in the rate of infusion for IV potassium chloride, in an ICU, using a Colleague<sup>™</sup> triple channel pump in "dose mode". A 108 mL bag containing 100 mmol of potassium

chloride (0.9 mmol/mL) was infusing at 10 mmol/hour. The dose was to be decreased to 7.5 mmol/hour. Approximately three minutes after the rate change the patient experienced a cardiac arrest. Within two minutes of the cardiac arrest someone noticed the IV pump was infusing at 705 mmol/hour (783 mL/hour) and the IV pump was stopped. The patient was successfully resuscitated. A number of lessons can be learned from this incident and the hospital took action to implement several procedural changes. A policy was implemented limiting the concentration of potassium chloride IV solutions to a maximum of 20mEq/50mL (20 mmol/50 mL). An independent double-check by a second practitioner is now emphasized on initiation of infusion, change in infusion rate and change of infusion bag for high alert drugs, including the higher concentrations of potassium chloride. Ideally, all infusion pump designs would prevent excessive volumes from being inadvertently infused and would have appropriate warning features. **ISMP Canada also strongly recommends discouraging the use of fractional units (such as 7.5) when prescribing, to avoid misinterpretation, or incorrect entry of the decimal place.**

In the second case, a patient was admitted to ICU requiring a number of IV medications including dopamine and norepinephrine (Levophed<sup>®</sup>). Due to the large volume of fluid being infused the Levophed infusion solution was changed from double strength to quadruple strength. The tubing was left unchanged, and therefore a residual volume of the original Levophed solution remained in the tubing. As soon as the pump was adjusted with the new Levophed concentration the infusion rate decreased accordingly. Therefore, the residual Levophed preparation in the tubing was infused at half the intended dose. The patient's

systolic blood pressure fell to 40 mm-Hg. A code was called and aggressive interventions were instituted to bring the patient's blood pressure back to normal. This incident demonstrates the importance of considering remaining medication residue in IV tubing when there is a change of concentration with highly potent drugs. Changing the tubing in this case would have lessened the risks from a change in concentration. Alternatively, standardization of inotrope concentrations can reduce the need to alter concentrations during the course of treatment.

In the third case, an elderly patient awaiting surgery was prescribed morphine 2 mg/hour subcutaneously. The hospital's pain management protocol includes the use of a CADD Legacy pump with a 100 mL cassette containing 10 mg/mL morphine. In programming the pump, the nurse entered 2 mL/hour instead of 2 mg/hour. This delivered a dose of 20 mg/hour. It is noted that the CADD Legacy pump allows for entry of the dose in mg/hour, mcg/hour or mL/hour. The error went unnoticed until the cassette was empty and the need for a cassette refill was questioned. Possible contributing factors identified by the hospital included: (i) there were two models of CADD pumps available – the newer CADD Legacy pumps and the older discontinued model 5800 pump; (ii) the pump setting for the narcotic had not been double-checked by a second nurse; (iii) the nurse who programmed the pump was new to the unit and unfamiliar with the Legacy CADD pump; (iv) pump settings were not checked during nurse shift change.

A number of recommendations worth repeating include:

- Implement a policy requiring an independent double-check for high alert drugs, especially those administered by infusion pumps. Independent double-checks are accomplished by having the medication and pump settings readied by one individual and independently checked against the physician's order by a second individual before administration.<sup>6,7</sup> Templates and checklists are being developed by ISMP Canada to assist practitioners in performing independent double-checking, including what, when, and how to check selected processes or drugs. This is in keeping with human factors engineering principles that have been incorporated in other safety conscious industries such as the airline industry that uses checklists to reduce reliance on an individual's memory.
- Provide orientation and training in the use of infusion pumps for all nursing staff, especially new nurses and agency nurses who may not be familiar with various pumps, their settings, or programming.
- Provide clear pump use instructions and a safety checklist with the infusion pump.
- Standardize concentrations of high alert drugs to minimize manoeuvring tubing changes and to minimize possible confusion with various strengths being used.
- Ensure a procedure for verification of pump settings during shift changes.

### References:

1. Health Canada. Health Products and Foods Branch. Notice to Hospitals. Health Canada endorsed important safety information on infusion pumps. April 16, 2004. Available at: [http://www.hc-sc.gc.ca/hpfb-dgpsa/tpd-dpt/infusion\\_pumps\\_nth\\_e.pdf](http://www.hc-sc.gc.ca/hpfb-dgpsa/tpd-dpt/infusion_pumps_nth_e.pdf). Accessed April 29, 2004.
2. Alert: Alarm not activated after infusion pump tubing incorrectly loaded. ISMP Canada Safety Bulletin Vol. 3, Issue 10, 2003
3. Infusion Pumps – Opportunities for Improvement. ISMP Canada Safety Bulletin, Vol 3, Issue 7, 2003
4. Quinn C, Boulton M, Hughes G. An Infusion of Safety. *Health Care Risk Rep* (UK) 2004;10(2):12-5.
5. ISMP's List of high-alert medications. Available at [www.ismp.org/MSAarticles/highalert.htm](http://www.ismp.org/MSAarticles/highalert.htm) Accessed May 5, 2004.
6. The virtues of independent double checks - they really are worth your time! ISMP Medication Safety Alert, March 6, 2003. Available at <http://www.ismp.org/msaarticles/time.htm>. Accessed May 6, 2004.
7. Maybe Santa's on to something... He checks his list twice, shouldn't we? ISMP Medication Safety Alert, December 12, 2001. Available at <http://www.ismp.org/msaarticles/santa.html>. Accessed May 6, 2004.

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ISMP Canada is a national voluntary medication incident and 'near miss' reporting program founded for the purpose of sharing the learning experiences from medication errors. Implementation of preventative strategies and system safeguards to decrease the risk for error-induced injury and thereby promote medication safety in healthcare is our collaborative goal.

To report a medication error to ISMP Canada: (i) visit our website [www.ismp-canada.org](http://www.ismp-canada.org) or (ii) email us at [info@ismp-canada.org](mailto:info@ismp-canada.org) or (iii) phone us at 416-480-4099. ISMP Canada guarantees confidentiality and security of information received. ISMP Canada respects the wishes of the reporter as to the level of detail to be included in our publications.