The Institute for Safe Medication Practices Canada (ISMP Canada) is an independent national nonprofit agency established for the collection and analysis of medication error reports and the development of recommendations for the enhancement of patient safety.

The Healthcare Insurance Reciprocal of Canada (HIROC) is a member-owned expert provider of professional and general liability coverage and risk management support.

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Secondary Infusions Require "Primary" Attention

ISMP Canada has received reports of eight errors involving the accidental administration of the primary intravenous (IV) solution when intending to initiate a secondary intermittent IV infusion to a patient. One example is provided in this bulletin. The hospital has shared circumstances of this event to provide warning to others and to highlight deficiencies in existing IV pump designs.

A patient in a critical care unit was receiving multiple continuous infusions through a multi-lumen central line. Potassium replacement comprising 20 mmoL of potassium chloride in 100 mL was ordered for IV infusion over 1 hour to treat serum hypokalemia. No IV access lines were available because an intermittent medication was being infused through the single, available plain primary line. Peripheral access was not an option. It was decided that the best option would be to temporarily stop the infusion of insulin (Humulin R, 1 unit/mL in 100mL). The nurse piggybacked the potassium minibag to the secondary infusion port in the insulin infusion line and set the secondary infusion rate to 100 mL/hour (with a volume to be infused limit of 100 mL), but forgot to open the roller clamp. The pump therefore drew solution from the primary insulin line. Another nurse discovered the error when she responded to the pump alarm indicating "air in line", after the contents of the minibag containing insulin finished infusing. The exact amount of insulin the patient received as a bolus dose is unknown. The patient required 50% dextrose IV to treat the resulting hypoglycemia, as well as treatment for worsening hypokalemia. (Insulin lowers serum potassium levels by causing both glucose and potassium to move out of the serum and into the cells.) The patient recovered without further sequelae.

With the assistance of the nurse who made the error, the hospital identified the following factors as contributing to the incident:

- Lack of a readily available plain IV access line.
- Use of the existing insulin line, rather than initiation of a plain solution line (e.g., normal saline solution and new tubing), to infuse the secondary medication. (Even if the roller clamp for the secondary line had been opened, a bolus of residual insulin 1 unit/mL in the tubing below the secondary line port would have been delivered.)
- Perceived patient acuity and urgency of the clinical situation.

Although the nurse used the programming feature for a secondary line, the pump (like most general infusion pumps) did not recognize the primary and secondary lines as separate entities and therefore could not activate an alarm to alert the nurse to the error. Because the clamp for the secondary line was not opened, the pump drew fluid from the primary line.

Forgetting to open the roller clamp of the secondary line is a common error.[1] Unfortunately, the avoidance of secondary line errors requires that each nurse maintain a level of vigilance to not only ensure that the roller clamp on the secondary line is open, but to also verify that the secondary line connection is activated; the secondary line is at the proper height in relation to the primary line to allow fluid to be drawn from the secondary line (accomplished by using manufacturer-supplied hooks); the primary line used has a back check valve to make certain that the secondary medication does not mix back into the primary solution; and to ensure that the maximum secondary infusion rate (if not preset by the manufacturer) is not exceeded (to prevent unintentional amounts of fluid from being drawn from the primary line). Given this complexity, it is not surprising that errors like this occur.

ISMP Canada has published several bulletins describing errors involving infusion pumps.[2,3,4] These clearly identify improvements needed in pump design and interim procedural safeguards that should be implemented to prevent error.

Ideally, an alarm should have notified the nurse that the secondary solution was not infusing and would have limited the amount of insulin delivered to the patient. ISMP Canada has contacted several pump manufacturers and informed them of the need to design and incorporate improvements related to secondary infusions as a priority.

The following procedural recommendations are offered for consideration by hospitals:

1. **Do not piggyback a secondary infusion into a high-alert[5] (e.g. insulin) primary drug infusion.**
2. Utilize education materials such as this bulletin to heighten awareness of the importance of always performing a visual check upon initiation of a secondary line to ensure that it is infusing properly (e.g., roller clamp is open, connection is not faulty) before proceeding to other tasks.

Look-alike Product Alert

A Registered Respiratory Therapist (also referred to as a Registered Respiratory Care Practitioner) reported a near miss involving look-alike nebules of ipratropium bromide solution for inhalation from PharmaScience and salbutamol solution for inhalation from Apotex (Figure 1). ISMP Canada has contacted both companies to alert them to this problem. ISMP Canada recommends that hospitals:

- Include a process to evaluate new products (or changes to existing product packaging and labels) for potential look-alike confusion. As in this instance, purchasing products from alternate manufacturers does not guarantee reduced look-alike potential.
- Evaluate formulary products with the end-user in mind and favour the selection of products which prominently display critical information on the label.
- Store nebules in their original packaging whenever possible.

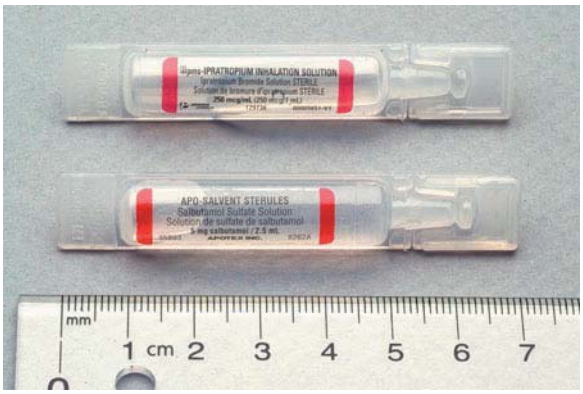

Figure 1. Look-alike nebules of ipratroprium bromide solution for inhalation and salbutamol solution for inhalation.

Calcium Gluconate Injection 10mL vial Label

Pharmaceutical Partners of Canada (PPC) recently launched the sale of a 10mL size of 10% calcium gluconate injection to fill a void in the market when another manufacturer discontinued their product.

ISMP Canada received concerns about the labelling of the product (Figure 2) and through collaborative efforts with health care professionals and PPC important changes to the label are being implemented (Figure 3):

- '1g/10mL' will be added to the front label in a prominent fashion (defined as critical information)
- the equivalency in mmol will be provided on the back label
- the PPC logo will be reduced in size to facilitate prominent display of all critical information.

Figure 2. Existing label for calcium gluconate injection 10mL vial

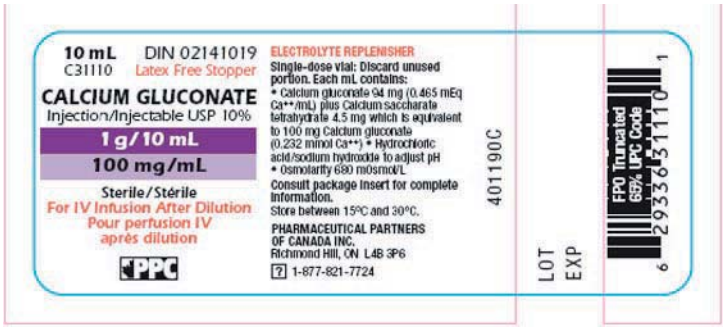

Figure 3. New label for calcium gluconate injection 10mL vial

References:

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2. Alert: alarm not activated after infusion pump tubing incorrectly loaded. ISMP Canada Safety Bulletin 2003;3(10):1-2.
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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, or (ii) e-mail us at 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.

A Key Partner in the Canadian Medication Incident Reporting and Prevention System (CMIRPS)