

ISMP Canada Safety Bulletin

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Neuromuscular Blocking Agents – Time for Action

A potentially life-threatening, near miss incident in the emergency department of a Canadian general hospital raises a warning flag. The sequence of events is as follows and, as will be discussed below, many Canadian hospitals are at risk for a similar incident:

- An order for intravenous “acyclovir 1 g IV q8h” was written in an emergency department where medications are supplied as wardstock.
- Since acyclovir was not a regularly stocked item, the nurse called pharmacy requesting a 1 g dose of acyclovir IV.
- The pharmacy technician answering the phone mistakenly sent two 10 mL vials of vecuronium bromide to the emergency department.
- The nurse was not familiar with either acyclovir or vecuronium and thought “vecuronium” must be a trade name for acyclovir. The nurse looked up information about acyclovir in a hospital IV manual and concluded there must be 500 mg acyclovir in each 10mL vial. The nurse also attempted to identify an alternate name for vecuronium in the Compendium of Pharmaceuticals and Specialties (CPS), but was unsuccessful. The nurse did not consider the possibility of a dispensing error.
- The reconstituted contents of the two vials were added to a minibag for administration. Fortunately, the nurse paid attention to internal warning signals of uncertainty and, at the last moment, called pharmacy to ask if vecuronium was the same drug as acyclovir. The pharmacist told the nurse **not** to administer the drug, and immediately went to the emergency department to confirm that the incorrect drug had been sent by pharmacy.

Administration of a neuromuscular blocking agent to a patient who is without ventilator support will lead to paralysis of respiratory muscles and respiratory arrest. The risk for serious patient injury, or death, is high. Previously reported errors with neuromuscular blockers describe similar substitution errors (the vial or syringe containing the neuromuscular blocking agent was mistaken for the intended product).¹⁻⁵ Some of the references report catastrophic outcomes and the suggestions for error prevention are incorporated into the recommendations below.

Possible contributing factors to the error described:

- Vecuronium vials that had previously been returned to the pharmacy (from the operating rooms) were inadvertently put into the acyclovir stock container.
- Although the neuromuscular blocking agents were segregated in the Pharmacy, this area happened to be in close proximity to the acyclovir product location.
- When obtaining the vials from the acyclovir stock, the pharmacy technician assumed the product was acyclovir and did not notice that the vials were vecuronium.
- Both the vecuronium and acyclovir products were purchased from Abbott. They are packaged in similar 10 mL vials. Both vials have red flip-top caps.
- The Abbott vecuronium product label has small print and does not bear a warning such as “Paralyzing Agent” on the label or on the vial cap.

Recommendations:

1. Bring this bulletin to the attention of all nursing and pharmacy staff, and relevant committees such as Safe Medication Practices, or the Pharmacy and Therapeutics Committee. This will help raise awareness of the dangers of neuromuscular blocking agents.
2. Limit the selection of formulary neuromuscular blocking agents in order to enhance familiarity and expertise with the selected products.
3. Review the packaging and labeling of the marketed products and choose products with clear labeling. The process of Failure Mode and Effects Analysis (FMEA) can facilitate identification of preferred labeling.
4. Segregate neuromuscular blocking agents within the pharmacy and include a sign that states: “Supply with a Warning Label”.

Sample warning label:

WARNING: Paralyzing Agent
Causes Respiratory Arrest
For use in intubated patients only.

As an alternative to creating a label, suppliers of labels, such as Pharmsystems®, have an existing warning label that can be ordered.

With respect to the error described above, a warning on the vecuronium product could have reduced the probability of the fundamental error (i.e. the returned vecuronium was added to the acyclovir stock).

Of interest, experts in human error and human perception have recommended the use of “multi-sensory warnings” such as a tactile label (feels different) in order to further reduce the probability of substitution errors with dangerous products.⁶

- Ideally neuromuscular blocking agents should not be stored in patient care areas, and pharmacy should dispense each dose with a bright auxiliary warning label. If these agents must remain in patient care areas (such as the emergency department or critical care areas), place the vials in plastic bags and apply the auxiliary warning label on both sides of the bag.¹ Consider providing additional labels that can be applied to the final product prepared for administration.
- A double-check process by a pharmacist is important when supplying drugs that are not regularly stocked items in a patient care area.

- Advise nursing staff and physician staff to immediately discard syringes of unused or partially used prepared doses.
- We recognize that the nurse had difficulty finding information in the drug references consulted. Consider outlining ‘pitfalls’ with the use of the CPS, and also ways to optimize the use of this reference (difference between “green pages” and “white pages”) when providing nursing orientation.
- This error is a good example of the need to verify any product supplied which is not exactly as ordered. It is also an example of a nurse’s paying attention to “internal warning signals” and can be used to illustrate the importance of seeking assistance whenever unsure.

The United States Pharmacopoeia is contemplating a requirement for manufacturers to include special label warnings for all neuromuscular blocking agents. In Canada, it is noteworthy that Organon’s vecuronium product (Norcuron®) has a vial cap that is prominently marked “paralyzing agent” (Figure 1). There is also an “anesthesia red” auxiliary label marked “vecuronium” attached to the vial that can easily be removed and added to the syringe or final product (Figure 2). ISMP Canada commends such safety measures and encourages them for all neuromuscular blocking agents.



Figure 1: Abbott vecuronium product (left) and Organon vecuronium product (right).



Figure 2: Abbott product (left) and Organon product (right) with red auxiliary label provided (attached to vial).

Notes:

- Abbott Laboratories Limited has been advised of the mix-up between their vecuronium and acyclovir products. It is recommended that all manufacturers of neuromuscular blocking agents add a warning statement to the product vial top and primary label panel.
- ISMP Canada has updated Health Canada on this issue. We will pursue avenues for recommending a Canadian standard to manufacturers of neuromuscular blocking agents i.e. include the words “Warning: Paralyzing Agent” on the top of the vial and on the product label.

If you have experienced a similar incident or have additional suggestions for error prevention with neuromuscular blocking agents please write to us at www.ismp-canada.org.

References:

1. Smetzer J, Cohen M eds. Near fatal pediatric accident should force reassessment of a common cost-cutting measure. ISMP Medication Safety Alert! Volume 4, Issue 17. August 25, 1999.
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5. Smetzer J, Cohen M eds. Safety Briefs. ISMP Medication Safety Alert! Volume 1, Issue 21. October 23, 1996.
6. Senders JW, Senders SJ. Failure Mode and Effects Analysis in Medicine. *In Medication Errors*. American Pharmaceutical Association. Washington 1999 p. 3.6-3.7.

This is only the Canadian portion of the December 18, 2002 issue of the ISMP Medication Safety Alert! newsletter. To read the whole issue, please check if your hospital is already on our subscription and distribution list. The subscription service is available in ISMP Canada web site.

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) email 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.