Medication Incidents Involving Heparin in Canada: "Flushing" Out the Problem

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Recently, there has been considerable media attention on, and public interest in, the medication incidents involving heparin that occurred in a hospital in Corpus Christi, Texas.[1] These incidents follow high-profile incidents involving the newborn twins of actor Dennis Quaid and his wife, Kimberley, in 2007 and the deaths of 3 infants in Indiana the previous year; all had received inadvertent overdoses of heparin during the flushing of IV catheters.[2,3] Canadian pharmacists, as well as nurses, physicians, health administrators, and the general public, may be wondering if similar problems are occurring in this country.

Overall, it is clear that there are problems with both the safety and the effectiveness of the medication-use system in Canada. For example, in the Canadian Adverse Events Study, drug- or fluid-related events accounted for nearly one-quarter of all of the adverse events observed.[4] In telephone interviews with 3003 adult Canadians for the Commonwealth Fund's 2007 International Health Policy Survey,[5] 6% of respondents reported that they had been given the wrong medication or the wrong dose within the previous 2 years; at the scale of the entire population (24.7 million adult Canadians in the 2006 census[6]), this figure represents almost 1.5 million Canadians. Although this survey is based on self-reported data, the responses of Canadians closely emulated those in the 6 comparator nations (Australia, Germany, the Netherlands, the United Kingdom, and the United States).

More specifically, heparin medication incidents are well documented in Canada. The Institute for Safe Medication Practices Canada (ISMP Canada) has been receiving voluntary medication incident reports from Canadian hospital facilities and individual practitioners since 2000, and as of June 30, 2008, its database held a total of 35 608 reports. Because the reports are submitted voluntarily, there are some important limitations in interpreting the data; however, general trends can be discerned. In particular, unfractionated heparin was involved in 1004 (2.8%) of these reports. The reports are further classified according to the outcome of the error, according to the system used by the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP).[7] Unfractionated heparin was involved in 74 of the 1487 incidents that resulted in death or some other type of harm or both (NCC MERP category E or greater), or about 1 in 20 (Table 1). This places heparin as the fourth most common drug involved in medication incidents resulting in death or harm, with warfarin, another anticoagulant, placing sixth. The incidents involving heparin that reportedly resulted in death or harm represented a variety of error types, including mix-ups and dose omissions for venous thromboembolism prophylaxis, as highlighted in previous issues of the *ISMP Canada Safety Bulletin*.[8,9]

Table 1. Top 10 Medications Involved in Medication Incidents Resulting in Death or Harm in Canada*†

Drug	No. of Incidents Resulting in Death or Harm	% of All Incidents Resulting in in Death or Harm‡
Insulin	145	9.8
Morphine	133	8.9
Hydromorphone	115	7.7
Heparin	74	5.0
Fentanyl	55	3.7
Warfarin	51	3.4
Metoprolol	37	2.5
Furosemide	32	2.2
Potassium	29	2.0
Oxycodone	21	1.4

*Data from the Institute for Safe Medication Practices Canada database of medication incidents reported voluntarily by facilities and individual practitioners, for January 1, 2000, to June 30, 2008.
†A single incident may involve more than one medication.
‡Percentages calculated on a denominator of 1487, the total number of incidents resulting in death or harm.

Thirteen of the reports in the ISMP Canada database deal specifically with line-flushing incidents and include mix-ups between vials with higher and lower concentrations of heparin; 2 of these cases resulted in death. In a recently completed study that examined more than 7000 medication orders for high-alert medications, including heparin, within 4 Canadian health authorities, 77% of the orders had at least one latent opportunity for error.[10]

RECOMMENDATIONS

In safety bulletins published in 2004[8] and 2006,[9] ISMP Canada made system-based recommendations for reducing the risks associated with unfractionated heparin. In addition, the Institute for Safe Medication Practices (ISMP) in the United States has made numerous recommendations, such as the use of bar-coding medication administration technology to prevent administration errors and the application of failure mode and effects analysis.[11] We suggest that readers refer to these open-access safety bulletins (see the reference list of this article for details) for specific recommendations; more generally, however, health care professionals need to be aware that incidents with anticoagulants may occur at any stage of the medication-use system. In the ISMP Canada database, of the 74 medication incidents involving unfractionated heparin that resulted in death or harm, 64% involved the administration stage, 16% involved the monitoring stage, 16% involved order entry and transcription, 14% involved prescriber ordering, and 14% involved dispensing and delivery (a single event may affect more than one stage); some events involved other stages as well.

There have been some encouraging developments related to the prevention of medication incidents involving unfractionated heparin. In particular, ISMP Canada released a heparin toolkit in December 2007 based on lessons learned from incident reports.[12] The recommendations from this toolkit were summarized in a recent issue of the *ISMP Canada Safety Bulletin*.[13] Accreditation Canada (formerly the Canadian Council on Health Services Accreditation) is introducing a new Required Organizational Practice that will address the availability of high-dose unfractionated heparin products in patient care areas in hospitals. In the United States, the Joint Commission, as part of its 2008 National Patient Safety Goals for Hospitals, has developed a comprehensive list of requirements for preventing errors with anticoagulation medications,[14] including requirements for monitoring procedures, programmable infusion pumps, and education of the patient and the family. In addition, safety experts, anticoagulation experts, and health care practitioners attended a multidisciplinary conference held earlier this year in the United States with goals that included sharing information and addressing issues to improve heparin safety.[15] In the United Kingdom, recommendations to enhance the safety of heparin, specifically its use for flushing IV catheters, were released recently after a review of related incidents.[16,17] Finally, Canada is among 7 countries tackling the issue of errors with high-concentration drugs as part of the new World Health Organization initiative, "Action on Patient Safety: High 5s", which targets 5 patient safety strategies. Although the issues related to heparin use are multifaceted, it is hoped that these initiatives, combined with current media attention, will serve to enhance heparin safety.

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Anticoagulation Clinics in North America: Operational Insights: Correction

In the byline for an article presenting the results of a survey of anticoagulation clinics in North America, the order of authors' names was incorrect.[1] The intended order appears here:

Tammy Bungard, Carla M Grant, Margaret L Ackman, and Ross T Tsuyuki

The contact information for correspondence related to the article is correct as published.

Reference

1. Tsuyuki RT, Bungard T, Grant CM, Ackman ML. Anticoagulation clinics in North America: operational insights. *Can J Hosp Pharm* 2008;61(4):249-255.