# Standardizing the Storage and Labelling of Medications: Part 1

*Jonas Shultz, Margot Harvie, Dawn McDonald, Jim Manley, and Mollie Cole*

Contributions to this column are prepared by the Institute for Safe Medication Practices Canada, a key partner in the Canadian Medication Incident Reporting and Prevention System (CMIRPS). From time to time, ISMP Canada invites others to share learning based on local initiatives.

## BACKGROUND

Several health care studies have examined the frequency of preventable adverse drug events. The Institute of Medicine has estimated that on average at least one medication is given in error to each hospital patient per day.[1] Other statistics suggest that the administration of up to one in every five medications is associated with some type of error.[2,3] These errors include administering the wrong drug or the wrong dose, or administering an intended drug at the wrong time or by the wrong route. Similarities between medication names (i.e., look-alike and sound-alike names) and labels (i.e., look-alike packaging), as well as unsafe storage practices, have been cited as contributory factors,[4,5] some of which have resulted in death.[6] In an effort to learn from and address such medication safety issues, the Calgary Health Region has begun an initiative to standardize and simplify the storage and labelling of medications. Labelling improvements will be the focus of a subsequent article. This article highlights the enhancements that are being made in the storage of medications.

The Calgary Health Region's medication storage initiative is being applied to more than 500 areas where medications are stored. These areas include inpatient pharmacies, patient care units, and outpatient clinics in a region that is made up of more than 100 facilities, including 12 acute care sites, 40 care centres, and a variety of community and continuing care sites, all of which serve a population of 1.1 million people.[7] This medication safety initiative specifically targets the functionality of the medication storage areas and the legibility of labels. The initial aim was to make recommendations that could be achieved quickly, beyond the benefits associated with computerization and automation. The specific goals of this initiative are as follows:

- to improve patient safety by decreasing preventable adverse drug events
- to reduce variability in the way medications are stored throughout the region
- to increase efficiency

As part of the Calgary Health Region's enhanced patient safety strategy,[8] new storage and labelling guidelines have been developed in response to learning from specific preventable adverse drug events such as those highlighted in the Alberta Medication Safety Collaborative Opioids (Narcotics) Project (a collaborative medication safety initiative of ISMP Canada, the Health Quality Council of Alberta, and the Alberta Regional Pharmacy Directors) and those involving deaths related to potassium chloride.[9,10] The storage and labelling guidelines in the Calgary Health Region apply human factors principles of display design[11] and are based on findings obtained in a regional quality improvement initiative, the 2004/05 Patient Safety Collaborative for Medication.

The following issues of concern were identified with medication storage:

- Multiple medications or multiple doses of a single medication were stored in one storage bin without a divider, which increased the likelihood of selecting the wrong medication.

- Medications were stored in unlabelled and open bins, which meant that individual health care practitioners often selected medications on the basis of visual properties of the medication and its packaging (e.g., size, colour). Look-alike packages may be particularly problematic in this situation. Contributing to the error potential was the fact that practitioners were sometimes unaware of a change in medication supplier(s) or changes to the appearance of product packaging made by suppliers.
- Excess quantities of certain medications were being stored, which increased the likelihood that medications would spill into adjacent bins; this also increased the number of expiration dates that needed to be checked.
- Inconsistencies in the way medications were stored within and between patient care areas forced health care workers to learn a variety of storage schemas.

## SAFETY ENHANCEMENTS

### Medication Storage Areas

- *Standardization:* The medication storage format was simplified and standardized for all areas in an effort to enhance consistency and efficiency. This standardization allows individual health care workers to learn how medications are organized in one area and to use that knowledge to find medications when working in different areas. This is particularly important for those who regularly work in several areas, for example, on one or more patient care units.
- *Clustering:* Medications have been "clustered" into logical groups (i.e., injectable, oral, and topical medications) in an effort to minimize choice and simplify searching for a specific medication. For example, a nurse who is looking for a tablet of acetaminophen can easily eliminate all injectable and topical medications from his/her search (see Figure 1).
- *Use of colour:* Coloured bins have been used to provide visual redundancy, which helps in distinguishing among the clustered medication groups.[12] For example, red, yellow, and green bins are used to store injectable, oral, and topical medications, respectively.

### Medication Bins

- *Minimize:* To reduce the opportunity for confusion, the number of medications and concentrations of the same medication stored in one bin has been minimized. When multiple medications or concentrations of the same medication have to be stored in the same storage bin, a labelled divider is used. The divider label (Figure 2) includes the name of the medication, the dosage form, the strength and the package size, and the number of items in each section. (Additional information on labelling will be provided in the subsequent article.)
- *Separate:* Narcotic storage bins were redesigned to separate narcotics according to the duration of action, i.e., short-acting and long-acting. Further differentiation was provided by adding a label to the applicable storage bins stating "LONG ACTING", similar to that applied to the narcotic package itself.

**Figure 1.** Medication storage area before (left) and after (right) implementation of changes. The new system uses red, yellow, and green bins to store injectable, oral, and topical medications, respectively.


**Figure 2.** Multiple medications stored in one bin, with divider labels, including the number of units to be maintained in each section.

## CONCLUSIONS

Completion of this medication safety initiative in the Calgary Health Region's patient care areas is expected

by fall of 2007. A formal evaluation of the storage and labelling guidelines is currently in progress. This assessment will examine the usability of the guidelines through such measures as the time spent in stocking and selecting medications, the number of medications placed in the wrong bin, and label visibility and legibility. Ongoing overall surveillance of preventable adverse drug events will continue to drive patient safety improvements. Although the impossibility of completely eliminating all preventable adverse drug events is acknowledged, the primary goal of this initiative is to enhance patient safety by reducing the overall probability of an incorrect drug selection.

Look for "Standardizing the Storage and Labelling of Medications: Part II", which will discuss the labelling component of this initiative, in the June 2007 Safe Medication Practices column.

**References**


1. Aspden P, Wolcott JA, Bootman JL, Cronenwelt LR. *Preventing medication errors*. Washington (DC): National Academic Press; 2007. Quality Chasm Series.
2. Barker KN, Flynn EA, Pepper GA, Bates DW, Mikeal RL. Medication errors observed in 36 health care facilities. *Arch Intern Med* 2002;162(16):1897-1903.
3. Kopp BJ, Erstad BL, Allen ME, Theodorou AA, Priestley G. Medication errors and adverse drug events in an intensive care unit: direct observation approach for detection. *Crit Care Med* 2006;24(2):415-425.
4. Cohen MR. Drug product characteristics that foster drug-use-system errors. *Am J Health Syst Pharm* 1995;52(4):395-399.
5. Lambert BL. Predicting look-alike and sound-alike medication errors. *Am J Health Syst Pharm* 1997;54(10):1161-1171.
6. Paralyzed by mistake. Preventing errors with neuromuscular blocking agents. *ISMP Med Saf Alert* 2005;10(19):1-3.
7. Millar C, Vanderburg G, Bullick T, O'Meara D, Sankey D. *Leading the way. Calgary Health Region report to the community*. Calgary (AB): Calgary Health Region; 2005 [cited 2006 Dec 29]. Available from: http://www.calgaryhealthregion.ca/communications/pdf/ 2005_report_to_the_community.pdf
8. Flemons WW, Eagle CJ, Davis JC. Developing a comprehensive patient safety strategy for an integrated Canadian healthcare region. *Healthc Q* 2005;8(Spec No):122-127.
9. Concentrated potassium chloride: a recurring danger. *ISMP Can Saf Bull* 2004;4(3):1-2.
10. Johnson RV, Boiteau P, Charlesbois K, Long S, U D. Responding to tragic error: lessons from Foothills Medical Centre. *CMAJ* 2004;170(11):1659-1660.
11. Wickens CD, Lee J, Lui Y, Gorden-Becker S. *An introduction to human factors engineering*. 2nd ed. Upper Saddle River (NJ): Pearson Education; 2004.
12. *Department of Defense design criteria standard: human engineering*. US Department of Defense; 1999 [cited 2005 Oct 11]. MIL-STD-1472F. Available from: http://hfetag.dtic.mil/docs-hfs/mil-std-1472f.pdf



**Jonas Shultz**, BA(Hons), MSc, is a Human Factors Consultant, Calgary Health Region, Calgary, Alberta.

**Margot Harvie**, RN, BN, is the Initiative Specialist for Medication Safety, Calgary Health Region, Calgary, Alberta.

**Dawn McDonald**, BSP, ACPR, is the Drug Therapy Management Pharmacist, Calgary Health Region, Calgary, Alberta.

**Jim Manley**, BPE, is the Pharmacy Technical Manager, Calgary Health Region, Calgary, Alberta.

**Mollie Cole**, RN, MN, GNC(C), is a Nurse Consultant for Professional Practice and Development, Calgary Health Region, Calgary, Alberta.

**e-mail:** info@ismp-canada.org

**ISMP Canada homepage:** http://www.ismp-canada.org



**Acknowledgements**

The authors greatly appreciate the review of this paper by Drs Jeff Caird and Jan Davies, University of Calgary, as well as other employees of the Calgary Health Region, including Steve Long (Director of Pharmacy), Janice Harvie (Communication Advisor), the Pharmacy Clinical Committee, and the staff who tested the guidelines.

ISMP Canada gratefully acknowledges the valuable learning that is gained from information reported by professionals in the Canadian health care community, which can then be shared to enhance medication system safety.