Standardizing the Storage and Labelling of Medications: Part 2

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

BACKGROUND

Several studies have addressed the need for pharmaceutical companies to improve medication labelling.[1,2] Criticisms have generally related to small font size, poorly designed and visually cluttered labels, and inadequate warnings.[1] In addition, similarities between medication names (i.e., look- and sound-alike names) and labels (i.e., look-alike packaging), as well as unsafe storage practices, have been cited as contributing to medication incidents and errors.[3,4] Coupled with research in human factors, this information can prompt and guide health care organizations to improve labelling in medication storage areas. Building on our previous article, which outlined an initiative within the Calgary Health Region to simplify the storage of medications,[5] the current article highlights specific improvements in medication labelling that were made in the inpatient care and pharmacy areas in an effort to enhance safety and improve efficiency.

ISSUES OF CONCERN RELATED TO MEDICATION LABELS

A variety of concerns related to the labelling of medication storage bins were identified through a human factors evaluation:

- small font size on labels
- handwritten labels
- labels placed on curved surfaces
- labels obstructed by the handle of a storage bin or medication package
- labels located on cupboard shelving not aligned with the corresponding storage bins

Each of these concerns can lead to the selection of the wrong medication or dose. For example, hydromorphone 1 mg/mL oral liquid was stored in a box on a shelf clearly marked with a label for ampoules of morphine 2 mg/mL and 10 mg/mL (Figure 1).
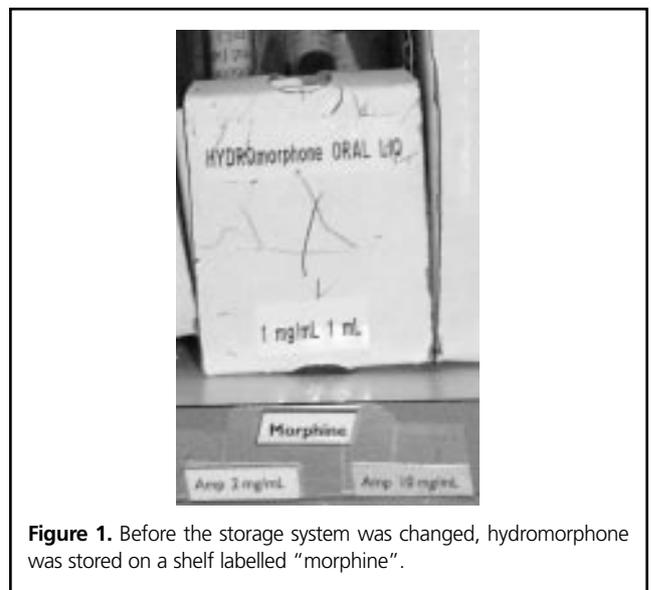
Figure 1. Before the storage system was changed, hydromorphone was stored on a shelf labelled "morphine".

SAFETY ENHANCEMENTS FOR MEDICATION LABELLING

Several safety enhancements for medication labels were identified, and key improvements were implemented as part of the initiative at the Calgary Health Region.

White Space

The fronts of storage bins are now labelled with only the medication name(s). This change was intended to improve the legibility of the label by reducing visual clutter and increasing the amount of white space.[6]

Use of Generic Names

Storage bins are now labelled with the generic name of a medication, rather than the trade name, to minimize confusion when the institution changes medication suppliers and also when the supplier changes the appearance of packaging for a particular medication.

Fonts

Type: A sans serif font (specifically **Arial**) is now used for medication labels. This type of font is better suited for labelling because it has consistent stroke widths and no added detail, which makes the characters more legible. These characteristics also allow discrimination between some pairs of similar characters (e.g., the letter "l" and the number "1").[7] This is particularly important when health care providers need to read labels quickly under less-than-optimal conditions.[8] In addition, for the labelling project, numeric information (e.g., dosage form, strength, and package size) was separated from (i.e., located underneath) the drug name, to further differentiate similar letters and numbers.

Size: The font sizes used are now large enough to ensure easy reading, a measure that also allows for the increasing average age (and associated general decline in eyesight) of health care providers in Canada. Design standards recommend a font height (for a capital letter) of at least 4 mm; a font height of 5 mm is preferable.[7,8]

4 mm   Arial 16
5 mm Arial 20

Case: Sentence-style lettering (mixture of capital and lowercase letters, as in regular text), rather than all-uppercase lettering, is now used for labels. With sentence-style lettering, the general shape of letters varies and is particularly clear with ascending (h, b), descending (p, g), and half-line (e, r) letters. This letter-shape variability increases the recognition of familiar words.[9,10] Moreover, with all-uppercase lettering, different words look similar in

the low-light environments[6] that are typical of medication storage areas.

TALLman lettering: Selective use of TALLman lettering (e.g., dimenhyDRINATE and diphenhydrAMINE) is now applied to highlight dissimilar letters in similarly spelled medication names. The use of TALLman lettering has been found to reduce confusion between drug names.[11] Identifying which medications should have TALLman lettering on labels and which letters should be capitalized was based on the FDA Name Differentiation Project[12] and on 2 objective methods developed by Lambert.[4]

Colour: Black text on a white background is now being used to maximize visual contrast and increase legibility.[7]

Text justification: All label text is now left-justified, as this format ensures consistent spacing between words. The use of left-justified text also makes it easier for the reader to find the beginning of each line.[13]

Content of Labels

Front label of storage bin: The front of each storage bin is now labelled with the generic name(s) of the medication(s) stored within.

Divider label: The divider label includes the following information:
- generic name of the medication
- dosage form
- strength
- package size
- maximum number of each item in each section of the bin (medication quota)
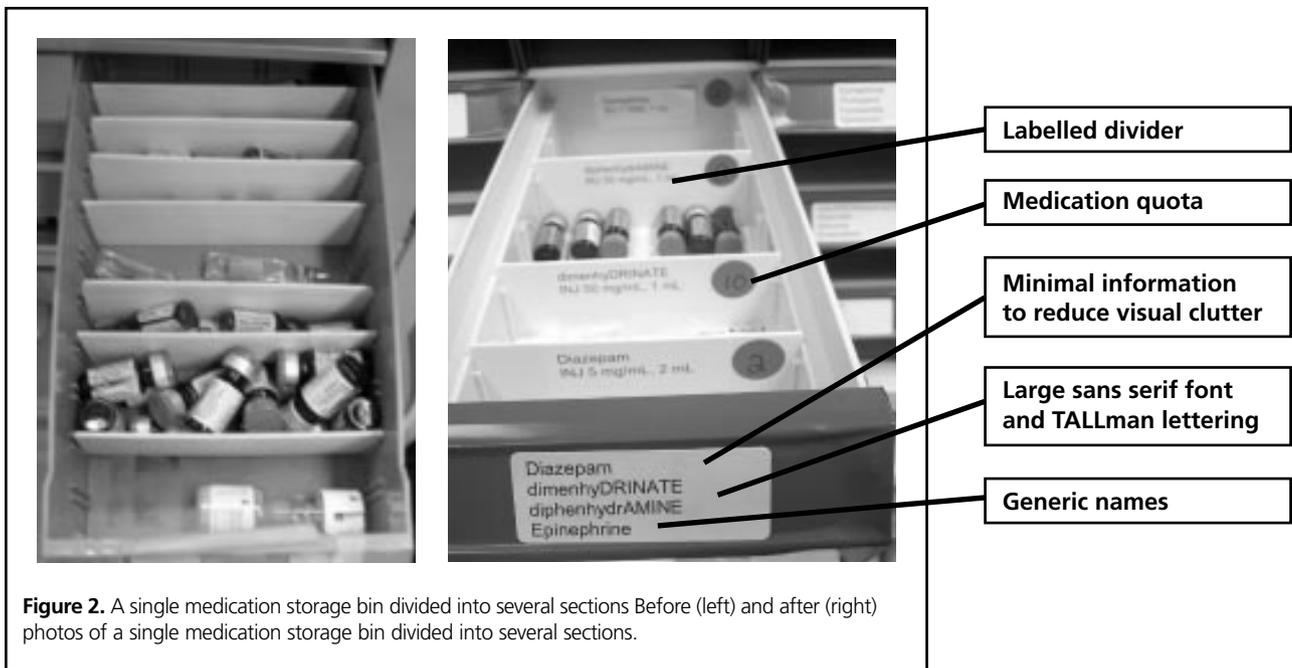
Information organization: The format of information displayed on the divider labels is now identical with the organization of information in the pharmacy and nursing computer systems of the Calgary Health Region.

Medication quota: Including the medication quota on the label improves the efficiency of the stocking process for pharmacy staff, who do not need to refer to an inventory sheet to identify which medications need to be refilled. Of note, it was important to ensure that the medications themselves did not obstruct the visibility of a label when a full stock of medication was present. The quota label was designed to be visually distinct (using a particular shape and colour), to minimize potential confusion between the quota label and the label identifying the medication concentration and dose.

Implementation

Figure 2 illustrates many of the labelling enhancements that have been made to medication storage in the Calgary Health Region, including use of a coloured "dot"

Figure 2. A single medication storage bin divided into several sections Before (left) and after (right) photos of a single medication storage bin divided into several sections.

label to identify the medication quota on the bin dividers (see Fig. 2, right-hand photo). The colour of the dot coincides with the colour of the storage bin and the route of administration (red = injectable, yellow = oral, green = topical).

CONCLUSIONS

Although the true incidence of preventable adverse drug events is unknown,[1] a recent report from the Institute of Medicine estimates that each hospital patient in the United States receives at least one medication in error per day.[14] The cost of these errors is estimated to be as high as US$2 billion per year.[15] The Canadian Adverse Events Study identified a 7.5% rate of preventable adverse events, and estimated that 9250 to 23 750 preventable deaths occur in Canada each year.[16] Drug- or fluid-related adverse events occurred in approximately 24% of patients in the same study. Computerization and automation can reduce some but not all preventable adverse drug events.[15] Initiatives such as that undertaken by the Calgary Health Region serve as examples of the use of standardization and simplification strategies to enhance the medication-use process before technologies such as bar coding and automated drug dispensers are implemented on a wide scale. The future introduction of additional technologies is expected to complement such standardization.

Patient care areas were the initial focus of the storage and labelling standardization in the Calgary Health Region, and 90% of such areas have now been reorganized in accordance with the new guidelines. Feedback from staff suggests that this initiative has improved their ability to both find and stock medications. A formal evaluation now in progress will examine the time spent stocking and selecting medications, the number of medications placed in the wrong storage bin, and label visibility and legibility. As noted previously,[5] we acknowledge the impossibility of eliminating all preventable adverse drug events; rather, our goal is to reduce the overall probability of an incorrect drug selection.

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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: jonas.shultz@calgaryhealthregion.ca

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