



**Labelling and Packaging:  
An Aggregate Analysis of  
Medication Incident Reports**

**Project Report**

The **Institute for Safe Medication Practices Canada (ISMP Canada)** is an independent national not-for-profit agency committed to the advancement of medication safety in all health care settings.

ISMP Canada works collaboratively with the health care community, regulatory agencies and policy makers, provincial, national, and international patient safety organizations, the pharmaceutical industry, and the public to promote safe medication practices.

ISMP Canada's mandate includes reviewing, and analyzing medication incident and near-miss reports, identifying contributing factors and causes, making recommendations for the prevention of harmful medication incidents, as well as leading collaborative system improvement initiatives.

**Key contacts for this project:**

Christine Koczmar, RN, BSc, Senior Analyst, Institute for Safe Medication Practices Canada

Valentina Jelincic, RPh, BScPhm, Consultant, Institute for Safe Medication Practices Canada

**Institute for Safe Medication Practices Canada**

4711 Yonge Street, Suite 501  
Toronto ON  
M2N 6K8

Telephone: 416.733.3131  
or toll free: 1.866.544.7672  
Fax: 416.733.1146

[www.ismp-canada.org](http://www.ismp-canada.org)

## Table of Contents

---

|  |           |
|--|-----------|
| <b>Background</b> .....                                | <b>1</b>  |
| <b>Project Report</b> .....                            | <b>2</b>  |
| <b>Findings of Qualitative Analysis</b> .....          | <b>2</b>  |
| 1. Main Theme: Drug Selection Confusion .....          | 3         |
| 2. Main Theme: Strength or Dose Confusion .....        | 6         |
| 3. Main Theme: Nonprescription Product Confusion ..... | 7         |
| 4. Main Theme: Route Confusion .....                   | 9         |
| 5. Main Theme: Formulation Confusion .....             | 10        |
| 6. Main Theme: Solution Confusion .....                | 11        |
| 7. Main Theme: Other Sources of Confusion .....        | 13        |
| <b>Conclusion</b> .....                                | <b>14</b> |
| <b>Acknowledgements</b> .....                          | <b>16</b> |
| <b>References</b> .....                                | <b>17</b> |

## Background

---

The information presented on the inner and outer labels of health products and the design and layout of this information constitute an important mechanism of communication to end users, both healthcare practitioners and consumers. Since ISMP Canada began accepting voluntary incident reports in 2000, reporters have repeatedly identified issues related to the labelling and packaging of health products as a concern. Some of these incidents have been described in previous issues of the ISMP Canada Safety Bulletin. Health Canada has also communicated about labels and packages as factors that have contributed to medication incidents.<sup>1-4</sup> This report shares findings from an aggregate analysis of reports received by ISMP Canada related to the labelling and packaging of health products available in Canada.

As a result of the number and types of errors submitted to reporting programs that relate to health product labels and packages, Health Canada recognized the need for a Canadian resource that would support manufacturers in designing labels and packages to be clear, accurate, and understandable. In 2012, Health Canada, in collaboration with ISMP Canada, began work towards developing a guide outlining principles for the design of health product labels<sup>a</sup> and packages with patient safety in mind. Its scope is intended to encompass all health products for human use: prescription and non-prescription pharmaceuticals, biologics, and natural health products. The guide is also intended to align with and support Health Canada's Plain Language Labelling Initiative for pharmaceuticals.<sup>5</sup>

The content of the guide will be based upon reviews of the literature, of national standards and initiatives (such as professional standards and guidelines), and of national and international regulations and guidance. An expert advisory panel comprising representatives of national and international organizations, established at the beginning of the project, is providing direction for development of the guide (see Acknowledgements section for the list of organizations represented on the panel). An environmental scan conducted with help from key stakeholder groups, including manufacturers, consumers/patients, and healthcare professionals, was identified as an important step in developing the guide. Included in the environmental scan was an aggregate

---

<sup>a</sup> Refers to the label on or affixed to an immediate container or the outside of a package. The product monograph and any other package inclusions were not included in the scope of this project.

analysis of pertinent incident reports received by ISMP Canada. The findings of the aggregate analysis are presented in this report.

## Project Report

---

The purpose of the aggregate analysis was to gain an overall understanding of labelling and packaging issues identified in voluntary reports received by ISMP Canada over a period of about 11.5 years (January 1, 2001 to May 15, 2012) and to gain a deeper understanding of potential systems-based contributing factors.

A search of the ISMP Canada database, in May 2012, for any report in which labelling or packaging was identified as a contributing factor or concern, yielded over 2000 reports. Additional inclusion criteria were applied to focus on reports specifying the manufacturer's labelling and/or packaging as an issue. Two analysts (a nurse and a pharmacist) then applied the following exclusion criteria:

- error occurred during the medication-use process but did not involve selection of a manufacturer's product
- error was a selection error involving a product that may have been repackaged
- error involved name confusion alone (i.e., no labelling and packaging issues)
- error report had insufficient detail for analysis

A total of 474 incident reports remained after application of the inclusion and exclusion criteria. A qualitative analysis was then conducted. Although it is impossible to infer or project the absolute occurrence rate of specific incidents on the basis of voluntary reports, the information available can be used to identify areas of concern that may require additional investigation or attention.

## Findings of Qualitative Analysis

A total of 7 main themes along with subthemes were identified. Factors potentially contributing to reported incidents are outlined according to each subtheme.

## 1. Main Theme: Drug Selection Confusion

| Subthemes   | Potential Contributing Factors   |
|---|--|
| Product mix-ups   | <p>Mix-ups between products from same manufacturer:</p> <ul style="list-style-type: none"> <li>▪ Look-alike labelling and packaging; of particular concern are high-alert medications</li> <li>▪ Trade dress* and brand name prominence</li> <li>▪ Crowding of information on labels</li> <li>▪ Lack of prominence of generic name or ingredients</li> <li>▪ Rebranding of label and change in prominence of well-known cues</li> <li>▪ Use of colour</li> <li>▪ Similar DINs</li> <li>▪ Look-alike adult and pediatric injectable products</li> <li>▪ Look-alike, sound-alike drug names, including product-line extensions</li> <li>▪ Storage proximity</li> </ul> <p>Mix-ups between products from different manufacturers:</p> <ul style="list-style-type: none"> <li>▪ Factors as listed for drugs from same manufacturer (except for rebranding)</li> <li>▪ Storage of small containers without their outer packages (e.g., ampoules, vials)</li> <li>▪ Display of brand name only ( e.g., Polyamp, minims, blister packs, suppositories)</li> <li>▪ Readability, font size, background (e.g., clear), colour contrast between background and printing</li> <li>▪ Printing on curved surface</li> <li>▪ Placement of drug name and dose (e.g., on a part of container that is removed when package is opened)</li> </ul> |
| 2-part products (e.g., drug and diluent, vaccine and diluent) | <p>Packaged together:</p> <ul style="list-style-type: none"> <li>▪ No clear indication on label that product has 2 components</li> <li>▪ Poor visibility of one of components</li> <li>▪ Labelling of diluent (e.g., ingredients and word 'diluent' not prominently displayed)</li> <li>▪ Look-alike labelling and packaging (e.g., 2 vials with similar appearance but containing different ingredients)</li> <li>▪ Diluent in prefilled syringe mistaken for a ready-to-use product</li> </ul> <p>Packaged separately:</p> <ul style="list-style-type: none"> <li>▪ Labelling and packaging of diluent (e.g., ingredients and the word 'diluent' not prominently displayed)</li> <li>▪ Look-alike labelling and packaging</li> </ul>   |
| Product information†  | <ul style="list-style-type: none"> <li>▪ Storage without outer package (because of storage constraints)</li> <li>▪ Indication for use not stated on label</li> <li>▪ Poor readability and visibility of information</li> </ul> <p>Transdermal patches:</p> <ul style="list-style-type: none"> <li>▪ Patch not readily visible or identifiable on patient's skin</li> </ul> <p>Blister packs:</p> <ul style="list-style-type: none"> <li>▪ Medicinal ingredients not listed together (e.g., generic names displayed apart, both before and after brand name)</li> <li>▪ Drug name not readable (e.g., contrast between background and print colour, drug name obscured by tablet)</li> <li>▪ Display of drug name (and dose)(e.g., information for remaining medication may be destroyed when dose[s] are removed)</li> </ul>   |

Note: Drug selection factors related to solutions are discussed under the main theme "solution confusion." Drug selection factors related to nonprescription products are discussed under main theme "non-prescription confusion." DIN = Drug Identification Number

\* Trade dress "describes any material quality of a product's packaging or physical appearance that serves a branding function."<sup>6</sup>

† Product information refers only to information provided on the label on or affixed to an immediate container or to the outside of a package.

## *Comments*

Three key subthemes related to selection of drugs were identified: product mix-ups (between products from the same or different manufacturers, with exclusion of reports where the manufacturer could not be determined), 2-part products (e.g., medications supplied in powder format that must be reconstituted with a product-specific diluent, where the components were packaged either separately or together), and confusion about product information (as related to ingredients or appropriate use of the product according to information on the label or package).

Interestingly, mix-ups between products from the same manufacturer appeared to involve products of various formats and sizes. Conversely, reported mix-ups involving products from different manufacturers typically occurred with small containers (e.g., ampoules, vials, minims). The latter may be related to the incident reports received from facilities where storage constraints often led to medications being stored without their outer packages in the care areas where they were to be used. It is however, also important to recognize that the inner package and label may be the only information readily available during preparation and for the final check before administration, regardless of how it is stored. Product mix-ups involving “high-alert”<sup>7</sup> medications, whether involving the same or different manufacturers, are of particular concern because such incidents are more likely to cause patient harm. Examples of incidents related to drug selection confusion have been highlighted in previous safety bulletins and newsletters.<sup>8-15</sup>

As noted by one healthcare practitioner who reported an incident involving product selection confusion, “a lot of concentration and time is required to ensure that you have the correct product in hand.”

A number of healthcare practitioners noted that repackaging or additional labelling was needed for certain types of medications. Examples included blister packs that had to be repackaged because the information on the foil package did not align with each tablet, suppositories that had to be repackaged because the generic name did not appear on the inner label, or alert labels that had to be added to products with look-alike potential or that had previously been involved in mix-ups. These examples suggest opportunities for manufacturers to consider enhancing labelling and packaging to meet the needs of end users.

### *Incident examples*

- A patient with insulin-dependent diabetes mellitus had a prescription for Novolin ge 30/70 Penfill insulin cartridges and was self-administering the drug every morning and every evening by insulin pen (Novolin-Pen). The patient had recently obtained a refill of the cartridge prescription from the community pharmacy, which consisted of several boxes of 5 cartridges each. On the morning of the incident, the patient had inserted a new cartridge from one of the new boxes into the insulin pen. A short time after self-injecting the prescribed morning dose, the patient was found in a diaphoretic state, with pupils dilated and a decreased level of consciousness. It was discovered that, along with several boxes of the correct Novolin ge 30/70 Penfill insulin cartridges, one box of NovoRapid Penfill insulin cartridges had been dispensed. A dose of Novolin ge 30/70 consists of 30% short-acting insulin and 70% intermediate-acting insulin, whereas NovoRapid is an ultrashort-acting insulin.<sup>16</sup>
- A clinic reported that in 4 cases of intended vaccination, it was likely that only the diluent had been administered, instead of the MMR (measles–mumps–rubella) vaccine that should have been prepared with the diluent. The error was identified when additional doses of the vaccine were received into stock, and the existing stock was counted. The count revealed 4 more vials containing MMR powder than vials of diluent. Staff at the clinic reviewed hundreds of charts but were unable to identify which patients might have received only the diluent.<sup>17</sup>
- In several incidents involving patients who were to receive glucagon, the product-specific diluent was administered on its own, because the glucagon powder was not properly reconstituted with the diluent before administration. In one case, patient harm resulted.<sup>17</sup>



## 2. Main Theme: Strength or Dose Confusion

| Subthemes                                 | Potential Contributing Factors  |
|---|---|
| Within a product line                     | <ul style="list-style-type: none"> <li>▪ Look-alike labelling and packaging of medication (strengths or concentrations); of particular concern are high-alert medications</li> <li>▪ Absence or ineffectiveness of cues for differences in strength or concentration</li> <li>▪ Look-alike, sound-alike drug names, such as brand name with modifier (e.g., “Plus”)</li> <li>▪ Same DIN for different volumes of liquid with same concentration (i.e., prefilled syringes)*</li> <li>▪ Similar DINs (e.g., DINs differing by only a single digit within a product line)</li> </ul>  |
| Expression or display of strength or dose | <ul style="list-style-type: none"> <li>▪ Strength of oral solid and total number of units in package displayed together (e.g., sample pack displays “x mg / 7 tablets”)</li> <li>▪ Total amount of injectable drug per total volume absent or not prominent</li> <li>▪ Concentration (amount per millilitre) not provided for injectable medications supplied in a volume of more than 1 mL</li> <li>▪ Variability in display of strength for injectable drugs with total volumes less than 1 mL (e.g., display may show total drug per millilitre)</li> <li>▪ Confusing layout of information (required volume for specified dose of injectable drug difficult to determine)</li> <li>▪ Amount of drug identified as salt versus base or element not clear</li> <li>▪ Strength not discernible once blister pack removed from outer box</li> <li>▪ Drug name and dose printed across 2 blisters (e.g., unclear if a single dose consists of 1 or 2 tablets)</li> <li>▪ Mismatch between display of information and perforations on blister pack</li> <li>▪ Lack of prominence and readability of dose information, in terms of font colour and size, background, and contrast (e.g., prefilled syringes)</li> <li>▪ Use of dangerous abbreviations or other designations (e.g., trailing zero)<sup>18</sup></li> </ul> |
| Product-use information                   | <ul style="list-style-type: none"> <li>▪ Necessary information for preparing dose (e.g., admixture instructions for injectable powder) not available or not readily available</li> <li>▪ Instructions for use (e.g., dialysis additives, enemas) not available or unclear</li> <li>▪ Graduations on container confusing, not visible, or not numerically specific to dose to be administered</li> </ul>   |

Note: Strength or dose factors related to solutions are discussed under the main theme “solution confusion.” Strength or dose factors related to nonprescription products are discussed under main theme “nonprescription confusion.”

DIN = Drug Identification Number

\*In follow up to reports of errors, Health Canada has revised its procedure for issuing DINs for unit dose prefilled syringes: see [http://www.hc-sc.gc.ca/dhp-mps/prodpharma/activit/announce-annonce/prefilled\\_din\\_preremplies-eng.php](http://www.hc-sc.gc.ca/dhp-mps/prodpharma/activit/announce-annonce/prefilled_din_preremplies-eng.php)

### Comments

Under this theme, reported incidents relating to product strength or dose involved selection of the correct product but at the incorrect strength or dose. Analysis of the error reports yielded 3 subthemes: confusion within a product line, confusion related to dose expression or display, and confusion about product-use information.

Strength or dose mix-ups involving high-alert medications were of particular concern, as administering the wrong dose even once can lead to patient harm.

Importantly, many incidents involving strength or dose confusion (as well as product selection errors, discussed under the previous theme) were identified by consumers who had received a medication from a healthcare provider such as the community pharmacist. These incidents

highlight the importance of healthcare practitioners engaging consumers and patients, and following up on any questions and concerns expressed.

*Incident examples*

- A patient was admitted to an intensive care unit with neurological bleeding. During medication reconciliation performed after admission, it was discovered that the patient had been taking low-molecular-weight heparin (via prefilled syringe) before the admission. However, because of a dispensing error (with the wrong prefilled syringes being dispensed), the patient had received a higher-than-intended dose of this medication for several weeks at home. The reporter noted that prefilled syringes with different total doses of the low-molecular-weight heparin had identical Drug Identification Numbers (DINs). Health Canada has since revised its procedure for issuing DINs for unit dose prefilled syringes.<sup>19</sup>
- A report identified poor labelling on a heparin vial, which resulted in a higher-than-intended dose of heparin being administered to a patient during surgery. The patient experienced bleeding and required protamine.

### 3. Main Theme: Nonprescription Product Confusion

| Subthemes            | Potential Contributing Factors   |
|----------------------|--|
| Product mix-ups      | <ul style="list-style-type: none"> <li>▪ Look-alike, sound-alike drug names, including product-line extensions</li> <li>▪ Look-alike labelling and packaging</li> <li>▪ Trade dress* and brand name prominence</li> <li>▪ Use of colour</li> <li>▪ Lack of prominence of ingredients</li> </ul>  |
| Strength or dose     | <ul style="list-style-type: none"> <li>▪ Lack of cues for differences in concentration or strength</li> <li>▪ Use of dangerous abbreviations or other designations (e.g., trailing zero)<sup>18</sup></li> <li>▪ Lack of clarity about strength or dose on immediate container when separated from outer packaging (e.g., blister pack labelling of drug and strength not related to perforations)</li> <li>▪ Drug name and strength printed across 2 blisters (e.g., unclear if a single dose consists of 1 or 2 tablets)</li> </ul>          |
| Product information† | <ul style="list-style-type: none"> <li>▪ Lack of prominence of ingredients (e.g., because of poor readability or small font size)</li> <li>▪ Warnings unclear or not prominent</li> <li>▪ Storage without outer package (where outer package displays ingredient information)</li> <li>▪ Mismatch between placement of perforations and display of information on blister packs (e.g., medicinal ingredient unclear when package is separated along perforations)</li> <li>▪ Confusion or mismatch related to administration device</li> </ul> |

\* Trade dress “describes any material quality of a product's packaging or physical appearance that serves a branding function.”<sup>6</sup>

† Product information refers only to information provided on the label on or affixed to an immediate container or to the outside of a package.

## *Comments*

Incidents involving nonprescription product confusion were reported by both healthcare practitioners and consumers and included reports submitted to ISMP Canada through the consumer reporting and learning program known as SafeMedicationUse.ca ([www.SafeMedicationUse.ca](http://www.SafeMedicationUse.ca)), which was launched in March 2010. Initiated as a pilot project, the SafeMedicationUse.ca program has become an established and integral aspect of ISMP Canada's efforts to improve medication safety.

Much has already been learned, through reporting for prescription medicines, about the design factors that can lead to product confusion. Similar concerns are emerging about the design and layout of information on nonprescription products, many of which are available to consumers and patients for self-selection, without the assistance and intervention of healthcare practitioners. For example, reports categorized within this main theme involved confusion about the strength or dose of a product, as well as confusion about ingredients. The products implicated in these reports included oral solid formulations (e.g., tablets, capsules), oral liquids, and liquids for external application.

Patients and consumers are key stakeholders in efforts to improve medication safety. Consumers and patients represent a unique source of information, often providing reports that are rich in detail. With a large number of health products available for purchase without a prescription, it is important to continue to strengthen the vital role that consumers can play in incident reporting and prevention. Experience with the SafeMedicationUse.ca program indicates that consumers and patients, as end users of health products, can provide important perspectives and insights toward improving medication safety. Their input can suggest opportunities to enhance labelling and packaging.

One consumer commented, "When one is fully awake and not sick, the packaging and separation of medication seems logical. ... However when one is sick (not feeling or thinking straight), taking the medication could not be done as intended. ... Drug companies should consider the consumer at the moments of usage/environment when designing pills and packaging."

### Incident examples

- A patient taking oral chemotherapy had been advised to take Gravol (dimenhydrinate). The patient later returned to the clinic reporting ongoing nausea. At that time, she mentioned that she was taking “nondrowsy” Gravol. The pharmacist realized that the patient had been taking the Gravol ginger product, instead of the Gravol product containing dimenhydrinate. Similarities in the name and appearance of the 2 products potentially contributed to this and other reported mix-ups involving these 2 products.<sup>20</sup>
- A consumer confused Clear Care with a multi-purpose contact lens solution and used it to rinse lenses directly before placing them in the eyes. The Clear Care product contains 3% hydrogen peroxide, which can cause pain and burning if it comes into contact with the eyes. Clear Care is packaged with a special lens cleaning case. When the product is used with the special case, the hydrogen peroxide is neutralized to a solution that is safe for the eyes. Other reports have been received from consumers who have experienced harm after improper use of Clear Care.<sup>21</sup>

## 4. Main Theme: Route Confusion

| Subtheme         | Potential Contributing Factors  |
|------------------|---|
| Miscommunication | <ul style="list-style-type: none"><li>▪ Similar containers for formulations intended for different routes of administration, such that label information is overlooked (e.g., topical liquid product provided in a vial)</li><li>▪ Similar dosage forms for different routes of administration (e.g., capsule, a form typically intended for oral use, provided for a drug intended for inhalation)</li><li>▪ Same DIN for a drug with different product formats (e.g., luer lock versus non-luer lock prefilled syringes) intended for different routes of administration</li><li>▪ Look-alike, sound-alike drug names</li><li>▪ Look-alike labelling and packaging of medications to be prepared and administered concurrently by different routes</li><li>▪ Storage location for end use</li></ul> |

Note: Wrong route factors related to solutions are discussed under the main theme “solution confusion.”

DIN = Drug Identification Number

### Comments

One of the earliest ISMP Canada Safety Bulletins highlighted published information about patient deaths from inadvertent intrathecal injection of vincristine intended for intravenous infusion.<sup>22</sup> Since that report (in 2001), the World Health Organization has published recommendations for the labelling of vincristine to prevent further such incidents.<sup>23</sup> However, route confusion involving other injectable, oral and inhaled medications continues to occur and has been highlighted in subsequent safety bulletins.<sup>24-26</sup>

The type of container or the format of the medication is often used by end users as a cue to the intended route of administration. With an increasing trend towards standardization of available containers, sourcing of appropriate packaging can be challenging. The medication, however, may be administered by the wrong route when the container or the format or appearance of the medication differs from the anticipated appearance (e.g., topical medication in a vial format). Although some medications can be administered by more than one route, the appropriate dosage often differs markedly depending on the route. If the intended route of administration is not used, harm can occur or efficacy may be compromised.

*Incident example*

- Various operating room practitioners have brought to ISMP Canada’s attention a specific concern about packaging for topical medications such as epinephrine. Although these medications are manufactured for topical use, the packaging may be similar to packaging used for vials containing injectable medications, specifically a vial with rubber stopper held in place by a metal ferrule. This format may lead some practitioners to use a needle and parenteral syringe to withdraw the medication before transferring it to an open container; the use of a parenteral syringe may lead to inadvertent administration by the intravenous route before transfer to the open container.<sup>24</sup> ISMP Canada continues to urge manufacturers to review products intended for topical use to ensure that they are supplied in a format distinct from that used for medications intended for injection. In particular, the format should not lead practitioners to use a parenteral syringe to withdraw the medication from the container.

**5. Main Theme: Formulation Confusion**

| Subthemes   | Potential Contributing Factors  |
|---|---|
| Release duration (for oral and injectable products) | <ul style="list-style-type: none"> <li>▪ Look-alike, sound-alike names such as product-line extensions (e.g., Contin)</li> <li>▪ Use of abbreviations to indicate release duration ( e.g., CD, CR, ER, IR, XL)</li> <li>▪ Look-alike labelling and packaging (e.g., depot versus regular-release injectable)</li> <li>▪ Changes to labelling and packaging of one formulation so that it appears more similar to (or the same as) another formulation of the same drug, increasing look-alike potential without consideration of end use</li> </ul> |
| Other issues (e.g., for topical products)           | <ul style="list-style-type: none"> <li>▪ Lack of prominence of formulation type (e.g., cream versus ointment )</li> <li>▪ Look-alike labelling and packaging</li> </ul>   |

## Comments

Reported incidents involving formulation confusion included those with medications having various durations of action. Some of these are high-alert medications, which have an increased risk of patient harm when there is a formulation mix-up.

## Incident example

- In several incidents, the long-acting (depot injection) and short-acting formulations of an injectable medication were mixed up. Reports indicated that the labelling and packaging of the products were “nearly identical”. One case involved a recent change in packaging, whereby 2 formulations of a drug were “standardized” to the same container type.

## 6. Main Theme: Solution Confusion

| Subthemes               | Potential Contributing Factors  |
|-------------------------|---|
| Plain or base solutions | <ul style="list-style-type: none"><li>▪ Look-alike labelling and packaging</li><li>▪ Variations in communication of names for intravenous solutions (e.g., use of acronyms or abbreviations)</li><li>▪ Crowding of information on labels</li><li>▪ Poor differentiation between smaller bag sizes such as 50-mL versus 100-mL (e.g., leading to selection error and preparation of incorrect drug concentration)</li><li>▪ Storage of products for end use</li></ul>  |
| Premixed medications    | <ul style="list-style-type: none"><li>▪ Look-alike labelling and packaging (e.g., leading to mix-up between solution containing a medication and plain solution or between 2 solutions each containing a different medication)</li><li>▪ Use of red print on bags other than sterile water bags</li><li>▪ Total amount per total volume not listed, with labelled amount per millilitre interpreted as the total amount in the entire container for a continuous infusion</li><li>▪ Storage of products for end use</li><li>▪ Crowding of information on labels</li></ul> |
| Concentration           | <ul style="list-style-type: none"><li>▪ Look-alike labelling and packaging</li><li>▪ Crowding of information on labels</li><li>▪ Lack of prominence in the display of drug concentration or total dose as required for typical dosing</li><li>▪ Storage of products for end use</li></ul>   |
| Route or purpose        | <ul style="list-style-type: none"><li>▪ Look-alike labelling and packaging</li><li>▪ Similar container formats for different routes (e.g., sodium chloride 0.9% versus sterile water for injection in a bag for pharmacy bulk use)</li><li>▪ Inappropriate presence of injection port (e.g., with an irrigation solution)</li><li>▪ Storage of products for end use</li><li>▪ Physical location of use (e.g., for a procedure that must be performed in a darkened room)</li></ul>  |

## Comments

Incidents of solution confusion involved solutions administered by healthcare practitioners, typically within a facility setting such as an acute care hospital. In some cases, the solutions

implicated were used intravenously for hydration (plain or containing electrolytes). Other cases involved solutions used for dialysis (e.g., continuous renal replacement therapy [CRRT]), solutions used for irrigation or inhalation, and those used by pharmacy staff to prepare medications. A key component common to incidents in this category was the type of container (i.e., bag format).

The use of flexible clear bags (e.g., polyvinyl chloride bag) entails labelling constraints and requirements additional to those that come into play for labelling other types of container. For example, there are technological constraints related to printing on this type of bag, where the label background is clear and dark colours must be used to ensure adequate contrast for readability.

Many years ago, the colour red was suggested for printing on bags containing sterile solutions, as a warning to prevent accidental intravenous infusion of these products.<sup>27</sup> The colour red can convey an alert or warning. This approach was more readily implemented than changing to a different type of container for such products and enhanced differentiation of sterile solutions from other solutions stored in bags.<sup>27</sup> However, as more and more sterile solutions are made available in bags, the prominence of red print and its effectiveness as a cue may be diminished.

#### *Incident examples*

- A patient received an intravenous infusion of sterile water, instead of the intended normal saline solution. Unfortunately, close to 600 mL of sterile water was infused before the error was discovered, through the presence of blood in the patient's urine. The patient experienced renal complications as a result of the damaging effects of hypotonic sterile water on red blood cells and required admission to the intensive care unit.<sup>28</sup>
- A solution of sodium chloride 3% was mistaken for a premixed heparin solution and was administered.<sup>29</sup>
- Sodium chloride 5%, instead of the intended sodium chloride 0.9% (i.e., normal saline), was used in a pharmacy for admixing a medication. Fortunately, the error was caught before the admixtures were dispensed.<sup>30</sup>
- Bags of an inotropic medication (for intravenous administration) containing the wrong concentration of drug were delivered by pharmacy to an intensive care unit.

- In 2 cases, a mix-up between the anticoagulant sodium citrate used for CRRT dialysis and a mannitol solution was identified before the error reached the patient.
- During a cardiac arrest, an infusion was prepared with dextrose 50% solution instead of dextrose 5% solution.
- A number of incidents involved mix-ups between various hydration solutions (e.g., sodium chloride 0.9% versus sodium chloride 0.45%, sodium chloride 0.9% with dextrose 5% versus dextrose 5%).
- A medication for continuous infusion was admixed in a 50 mL bag instead of a 100 mL bag. The patient received the wrong concentration of medication for several hours.
- In several cases, 0.9% sodium chloride solution and a nonelectrolyte solution for irrigation for concurrent use during a procedure were mixed up. According to the reports, none of the incidents resulted in harm; however, the reporters raised concerns about the potential for burns if the wrong solution were to be used for irrigation during cautery.

## 7. Main Theme: Other Sources of Confusion

| Subthemes                      | Potential Contributing Factors   |
|--------------------------------|--|
| Expiry date                    | <ul style="list-style-type: none"> <li>▪ Variations in expression of dates</li> <li>▪ Ambiguity of expression of dates (e.g., 11-01-12 or 20130301)</li> <li>▪ Reduced readability related to colours used and background contrast (e.g., nebulas, blister pack)</li> </ul>  |
| Lot number                     | <ul style="list-style-type: none"> <li>▪ Poor readability</li> </ul>   |
| Package size or type confusion | <ul style="list-style-type: none"> <li>▪ Look-alike labelling and packaging for different quantities of a particular drug (e.g., same size bottle for different quantities of tablets)</li> <li>▪ Poor layout or presentation of information leading to misinterpretation of total quantity in package as dose</li> <li>▪ Change in quantity of a drug provided without change in packaging or other cues</li> </ul> |

### *Comments*

Health Canada requires that several specific types of information be included on product labels. For example, an expiry date must appear on every product label, to convey the level of safety, purity, and potency of a medication if stored appropriately. The lot number is required to allow appropriate actions in the event of a product recall. Each lot number is a unique combination of letters or numbers (or both) allowing the drug to be traced to the manufacturer and, if applicable, to the distributor or importer.



### *Incident examples*

- One reporter expressed concern about expiry dates presented in a compressed form (e.g., 2 digits each for year, month, and day). The reporter noted that in some situations, it may be impossible to tell what each 2-digit number represents.
- Several reporters identified difficulty in reading the expiry date or lot number because of the colour of the type or poor contrast between the print and the background.

## **Conclusions**

Voluntary reports identifying labelling, packaging, and naming issues as factors contributing to medication incidents offer an important opportunity for improvements to support the safe and effective use of health products by healthcare professionals, patients, and consumers. Over the years, such reports have led to valuable learning and more than 60 voluntary changes by manufacturers, some of which have been highlighted in past bulletins.<sup>27,31-34</sup> It is clear that many manufacturers are open to dialogue and are willing to make changes to labelling and packaging to enhance medication safety. The results of the aggregate analysis shared in this bulletin provide insights into issues experienced by the users of health products and will help to inform the development of a guide for manufacturers to support the design of labels and packages with patient safety in mind. These results are being reviewed in conjunction with a wide range of other available information to identify the topics to be covered in the guide. It is anticipated that a draft version of the guide will be released by Health Canada for consultation in 2014.

For more information, please email [cmirps@ismp-canada.org](mailto:cmirps@ismp-canada.org)



## Acknowledgements

This report provides an opportunity to express sincere appreciation to the healthcare professionals, consumers, and patients who have submitted reports about medication incidents to ISMP Canada for their initiative, their effort, and their demonstrated support for a culture of learning exemplified by their sharing of information about medication incidents.

A special thank-you is extended to the expert advisory panel for their direction, input, and continued support to the labelling and packaging guide (in alphabetical order): Canadian Anesthesiologists' Society; Canadian Association of Naturopathic Doctors; Canadian Nurses Association; Canadian Pharmacists Association; Canadian Society of Hospital Pharmacists; European Medicines Agency; Health Canada; Institute for Safe Medication Practices, United States; Medicines and Healthcare Products Regulatory Agency, United Kingdom; Medicines Evaluation Board, The Netherlands; Patients for Patient Safety Canada; Therapeutic Goods Administration, Australia; and U.S. Food and Drug Administration. We also extend sincere appreciation to those who have provided (and are continuing to provide) expertise in graphic design and human factors engineering.

## References

---

1. Health Canada's role in the management and prevention of harmful medication incidents. Ottawa (ON): Health Canada; modified 2011 Jun 20 [cited 2013 Aug 20]. Available from: <http://www.hc-sc.gc.ca/dhp-mps/medeff/cmiprps-scdpim-eng.php>
2. Maalox Multi Action (bismuth subsalicylate) – confusion with other Maalox liquid products – for the public. Ottawa (ON): Health Canada; 2010 May 17 [cited 2013 Aug 20]. Available from: <http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2010/14079a-eng.php>
3. Adrenalin (epinephrine chloride 1:1000) intended for topical use – risk of inadvertent injection – notice to hospitals. Ottawa (ON): Health Canada; 2010 Aug 17 [cited 2013 Aug 20]. Available from: <http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2010/14589a-eng.php>
4. Risk of eye injury with improper use of certain contact lens solutions. Ottawa (ON): Health Canada; 2013 Apr 25 [cited 2013 Aug 20]. Available from: <http://healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2013/28539a-eng.php>
5. Consultation on the Plain Language Labelling Initiative. Ottawa (ON): Health Canada; modified 2013 Jun 24 [cited 2013 Sep 3]. Available from: [www.hc-sc.gc.ca/dhp-mps/consultation/drug-medic/consult\\_pll\\_elc-eng.php](http://www.hc-sc.gc.ca/dhp-mps/consultation/drug-medic/consult_pll_elc-eng.php)
6. Greene JA, Kesselheim AS. Why do the same drugs look different? Pills, trade dress, and public health. *N Engl J Med*. 2011;365(1):83-89.
7. ISMP high-alert medications. Horsham (PA): Institute for Safe Medication Practices; 2013 [cited 2013 Aug 20]. Available from: <http://www.ismp.org/tools/highalertmedicationLists.asp>
8. Human factors and substitution errors. *ISMP Can Saf Bull*. 2003 May [cited 2013 Aug 26];3(5):1-2. Available from: <http://ismp-canada.org/download/safetyBulletins/ISMPCSB2003-05HumanFactors.pdf>
9. More on potassium chloride. *ISMP Can Saf Bull*. 2003 Nov [cited 2013 Aug 26];3(11):1-2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2003-11KCl.pdf>
10. A need to “flush” out high concentration heparin products. *ISMP Can Saf Bull*. 2004 Oct [cited 2013 Aug 26];4(10):1-2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2004-10.pdf>
11. System vulnerabilities across the spectrum of care: another mix-up between choral hydrate and potassium chloride. *ISMP Can Saf Bull*. 2005 Oct 6 [cited 2013 Aug 26];5(7):1-2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2005-07ChoralHydrate.pdf>
12. Risk of mix-ups between ephedrine and epinephrine. *ISMP Can Saf Bull*. 2007 May 18 [cited 2013 Aug 26];7(2):1-3. Available from: <http://ismp-canada.org/download/safetyBulletins/ISMPCSB2007-02Ephedrine.pdf>
13. “Paralyzing” mix-ups in the operating room: opportunity to improve safety with neuromuscular blockers. *ISMP Can Saf Bull*. 2004 Jul [cited 2013 Aug 26];4(7):1-2.

Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2004-07.pdf>

14. Patient report of insulin mix-up shared. ISMP Can Saf Bull. 2007 Dec 8 [cited 2013 Aug 26];7(6):1-2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2007-06InsulinMixUp.pdf>
15. Labelling of iron products. ISMP Can Saf Bull. 2009 April 21 [cited 2013 Aug 26];9(3):1-2. Available from: <http://ismp-canada.org/download/safetyBulletins/ISMPCSB2009-3-LabellingofIronProducts.pdf>
16. Patient report of insulin mix-up shared. ISMP Can Saf Bull. 2007 Dec 8 [cited 2013 Aug 26];7(6):1-2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2007-06InsulinMixUp.pdf>
17. Administration of product-specific diluent without medication. ISMP Can Saf Bull. 2010 Sep 30 [cited 2013 Aug 26];10(7):1-3. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2010-07-ProductSpecificDiluent.pdf>
18. Eliminate use of dangerous abbreviations, symbols, and dose designations. ISMP Can Saf Bull. 2006 Jul 16 [cited 2013 Aug 26];6(4):1-3. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2006-04Abbr.pdf>
19. Notice: Revision of the procedure on the issuance of drug identification numbers (DINs) for unit dose pre-filled syringes. Ottawa (ON): Health Canada; 2010 Jun 10 [cited 2013 Aug 20]. Available from: [http://www.hc-sc.gc.ca/dhp-mps/alt\\_formats/pdf/prodpharma/activit/announce-annonce/prefilled\\_din\\_preremplies-eng.pdf](http://www.hc-sc.gc.ca/dhp-mps/alt_formats/pdf/prodpharma/activit/announce-annonce/prefilled_din_preremplies-eng.pdf)
20. Look-alike Gravol ginger product causes confusion for consumers. SafeMedicationUse.ca Med Saf Alert. 2010 Aug 17 [cited 2013 Aug 29];1(3):1. Available from: [http://www.safemedicationuse.ca/alerts/alerts\\_gravol.html](http://www.safemedicationuse.ca/alerts/alerts_gravol.html)
21. Reminder: take care with Clear Care. SafeMedicationUse.ca Med Saf Alert. 2012 Oct 31 [cited 2013 Aug 29];3(5):1. Available from: [http://www.safemedicationuse.ca/alerts/alerts\\_reminder\\_clear\\_care.html](http://www.safemedicationuse.ca/alerts/alerts_reminder_clear_care.html)
22. Published data supports dispensing vincristine in minibags as a system safeguard. ISMP Can Saf Bull. 2001 Oct 3 [cited 2013 Aug 26];1(1):1. Available from: <http://ismp-canada.org/download/safetyBulletins/ISMPCSB2001-10Vincristine.pdf>
23. World Health Organization recommendations for vincristine. ISMP Can Saf Bull. 2008 Apr 4 [cited 2013 Aug 25];8(2):3. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2008-02Methotrexate.pdf>
24. Alert: fatal outcome after inadvertent injection of epinephrine intended for topical use. ISMP Can Saf Bull. 2009 Mar 5 [cited 2013 Aug 26];9(2):2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2009-2-InadvertentInjectionofEpinephrineIntendedforTopicalUse.pdf>
25. Incidents reported with Spiriva capsules and inhalation device. ISMP Can Saf Bull. 2009 Dec 30 [cited 2013 Aug 26];9(10):3-4. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2009-10-AnalysisOfInternationalFindingsFromIncidentsInvolvingFentanylTransdermal.pdf>

26. Some capsules are not meant to be swallowed. SafeMedicationUse Newsl. 2013 Jul 31 [cited 2013 Aug 27];4(5):1. Available from: [http://www.safemedicationuse.ca/newsletter/newsletter\\_CapsulesNotToBeSwallowed.html](http://www.safemedicationuse.ca/newsletter/newsletter_CapsulesNotToBeSwallowed.html)
27. Enhanced sterile water label paves way for national standard. ISMP Can Saf Bull. 2003 Jun [cited 2013 Aug 29];3(6):1. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2003-06SterileWater.pdf>
28. Sentinel event with sterile water: lessons shared. ISMP Can Saf Bull. 2002 Apr [cited 2013 Sep 4];2(4):1-2. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2002-04SterileWater.pdf>
29. Reported error with sodium chloride 3% reminds of the need for added system safeguards with this product. ISMP Can Saf Bull. 2001 Nov [cited 2013 Aug 29];1(2):1. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2001-11NaCl.pdf>
30. Reported look-alike concerns with labelling for sodium chloride 0.9% and hypertonic sodium chloride IV solutions lead to change. ISMP Can Saf Bull. 2009 Nov 26 [cited 2013 Aug 29];9(8):3. Available from: <http://ismp-canada.org/download/safetyBulletins/ISMPCSB2009-8-WHOGuidanceReportingPrograms.pdf>
31. Morphine ampoule look-alike packaging alert. ISMP Can Saf Bull. 2004 Nov [cited 2013 Aug 29];4(11):1. Available from: <http://ismp-canada.org/download/safetyBulletins/ISMPCSB2004-11.pdf>
32. Enhanced labelling of neuromuscular blocking agents makes a difference. ISMP Can Saf Bull. 2007 Nov 13 [cited 2013 Aug 29];7(5):3. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2007-05Fentanyl.pdf>
33. Manufacturer removes logo to enhance medication safety. ISMP Can Saf Bull. 2007 Nov 13 [cited 2013 Aug 29];7(5):3. Available from: <http://www.ismp-canada.org/download/safetyBulletins/ISMPCSB2007-05Fentanyl.pdf>
34. Narcotic (opioid) medication safety: manufacturer enhances safety by changing vial closures for injectables. ISMP Can Saf Bull. 2011 Sep 30 [cited 2013 Aug 29];11(6):2. Available from: [http://ismp-canada.org/download/safetyBulletins/ISMPCSB2011-06-Updated\\_OR\\_Standards.pdf](http://ismp-canada.org/download/safetyBulletins/ISMPCSB2011-06-Updated_OR_Standards.pdf)