ISMP Medication Error Report Analysis

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These medication errors have occurred in health care facilities at least once. They will happen again—perhaps where you work. Through education and alertness of personnel and procedural safeguards, they can be avoided. You should consider publishing accounts of errors in your newsletters and/or presenting them at your in-service training programs. Your assistance is required to continue this feature. The reports described here were received through the Institute for Safe Medication Practices (ISMP) Medication Errors Reporting Program. Any reports published by ISMP will be anonymous. Comments are also invited; the writers' names will be published if desired. ISMP may be contacted at the address shown below. Errors, close calls, or hazardous conditions may be reported directly to ISMP through the ISMP Web site (www.ismp.org), by calling 800-FAIL-SAFE, or via e-mail at ismpinfo@ismp.org. ISMP guarantees the confidentiality and security of the information received and respects reporters' wishes as to the level of detail included in publications.

What's in a Generic Name? Clues About the Drug's Use and Possible Adverse Effects

Many health care professionals, particularly pharmacists, know that they can use a drug's nonproprietary (generic) to help position it among other drugs in the same therapeutic class by recognizing drug name stems, a collection of short name fragments, that have been embedded in the nonproprietary drug names. Because drugs in each of these therapeutic classes work on similar sites in the body and have similar effects and side effects, the nonproprietary name can help health care professionals understand how the drug might be used clinically and alert them to possible adverse effects often seen with drugs within the specific class of medications. However, not all health care professionals realize that nonproprietary drug names provide these very important clues.

USAN Naming Process

Since 1961, the United States Adopted Names (USAN) Council has been responsible for selecting simple, informative, and unique nonproprietary drug names based on pharmacological and/or chemical relationships.^{1,2} Pharmaceutical companies must obtain a generic name before bringing a new drug to the market. Today, there are 5 members of the USAN Council, including the American Medical Association, United States Pharmacopeia (USP), American Pharmacists Association, US Food and Drug Administration (FDA), and a member at large. ISMP also has an important role with USAN by identifying medication errors that have been tied to nonproprietary drug names.

At the crux of the USAN naming process is the collection of standard stems used as prefixes, suffixes, and infixes to identify the pharmacologic property and/or chemical structure of the medication. Sometimes, the standard name stems used for nonproprietary drug names can lead to name similarities that cause mix-ups among the various drugs with the same stem. However, the stem helps position an unfamiliar drug with others in a class and provides clues as to its use and effects. For example, drugs ending in the stem -olol belong to the class of drugs known as beta blockers. Some examples of beta blockers available in the United States include atenolol, bisoprolol, esmolol, metoprolol, and propranolol. Although this class of drugs may be used to treat a variety of conditions, in general, a drug with an -olol stem in its generic name is often used to treat heart failure, cardiac arrhythmias, and hypertension and shares similar adverse effects like bradycardia and hypotension.

Another example is the group of drugs ending with the stem -oxetine used for antidepressants (FLUoxetine type). Examples of drugs with this name stem include vortioxetine (TRINTELLIX), FLUoxetine (PROZAC), and PARoxetine (PAXIL). These drugs are selective serotonin reuptake inhibitors. They work by increasing levels of the neurotransmitter serotonin in the brain by blocking their reabsorption or reuptake. These drugs are used for various psychiatric disorders such as depression, anxiety, and obsessive-compulsive disorder. They share many of the same side effects.

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Table 1. Comparison of Nonproprietary Drug Names.

USAN	INN
Acetaminophen	Paracetamol
Albuterol	Salbutamol
glyBURIDE	Glibenclamide
Meperidine	Pethidine
rifAMPin	Rifampicin
Torsemide	Toraseamide

Note. USAN = United States Adopted Names; INN = International Nonproprietary Names.

Once the nonproprietary names are built using the appropriate stem and other conventions, the pharmaceutical company may supply a syllable of two that is meaningful to the drug development process. For example, the multiple myeloma drug carfilzomib (KYPROLIS) includes the stem -zomib reserved for proteasome inhibitors; it is also named after molecular biologist Philip Whitcome and his wife, Carla, who both died from cancer (“fil” instead of “phil” was used for Phillip to make the drug name globally compatible).³ Dasatinib (SPRYCEL) includes the stem -tinib reserved for tyrosine kinase inhibitors and is also named after research fellow Jagabandhu Das.³

Coordination of Nonproprietary Drug Names

The USAN Council seeks to coordinate nonproprietary drug names with the World Health Organization International Nonproprietary Names (INN) Program so that a single, acceptable worldwide generic name is used. The single generic name also facilitates communication in global professional journals and research. The INN system began operating in 1950, earlier than USAN, when the first list of INN for pharmaceutical substances was published.⁴ With few exceptions (Table 1), nonproprietary drug names used in the United States are the same as those adopted for use outside the United States by the INN.

Understanding the clues found in nonproprietary drug names is much like learning English vocabulary by studying Greek and Latin roots—learn what the stem means and you’ll have clues to help understand what the drug does and how it affects the body.³ Unfortunately, not all health care professionals involved in the medication use process have been taught to recognize drug name stems. Generic names may be a mystery requiring brute memorization, and these health care professionals may not associate the drug with potential adverse effects within a certain class of drugs. Some health care professionals may have received extensive education during academic and clinical training regarding medications, including pharmacology, therapeutic uses, possible adverse effects, and potential interactions, but the drug nomenclature and importance of stems may not have been stressed.

Despite this lack of training, it is more than likely that health care professionals have learned, through experience, that drugs with generic names that end in -cillin are antibiotics in the

penicillin family; drugs with names that end in -pressin are vasoconstrictors; drugs with names that end in -prazole are anti-ulcer drugs; drugs with names that end in -parin are heparin derivatives; and so on. But if they have not been explicitly taught to recognize the stems in generic names, it may be difficult to classify drugs into categories so that much of the general mechanism of action, intended indication, and possible adverse effects can be known simply from the drug name. This is not to say that health care professionals should not investigate unfamiliar medications to learn more about them but rather that important clues with the drug name that could signal the need for additional information or patient evaluation might be easily overlooked.

How ISMP and Pharmacists Can Help

There are hundreds of drug name stems and subgroups of these stems used by USAN and INN. For example, the general stem -cept refers to receptor molecules, and the subgroups define the targets (eg, -farcept for interferon receptors, -vircept for antiviral receptors). New stems are constantly being created for novel pharmacologic categories of medications.⁵ Exhaustive lists or lists that describe the meaning of drug name stems in terms that may not be understandable to all health care professionals without extensive training in pharmacotherapy (eg, phosphodiesterase-5 enzyme inhibitors for -afil [ie, tadalafil]) may not be helpful. However, pharmacists can help provide other health care professionals with information about the stems associated with the most common drugs prescribed or administered within their specialties, along with the stems for drugs used to treat common chronic conditions. Short educational programs covering a few stems at a time related to a specific class of medications are recommended. This should be accompanied by information regarding the clinical effects and common or dangerous adverse effects found within each class of drugs.

To this end, ISMP plans to begin highlighting common drug name stems in its publications to promote their recognition and understanding of the many benefits that health care professionals receive when they understand this nomenclature. ISMP is borrowing the idea from an outstanding effort that is already underway in the French publication, *Prescrire International*, a subscription-based journal that provides reliable, independent information that enables fully informed decision making about medications.⁶ The journal, which has long advocated the use of the INN as an important tool in the appropriate use of medications, also offers a free *Independent Drug & Healthcare Newsletter*.⁷

Scanning Difficult Through Intravenous (IV) Bag Overwrap

We have received several complaints about the position of a seam on the protective overwrap of B. Braun heparin

premixed solutions. Hospital staff often scan the barcode on heparin bags when restocking automated dispensing cabinets to ensure that the bags are placed in the correct stock location. The barcode that identifies the product is printed above the barcode for the lot and expiration date but behind a crimped seam on the clear overwrap (Figure 1), making it difficult or impossible to scan the barcode without removing the bag from the overwrap. Removing a bag from its overwrap affects how long the bag can be stored and is not recommended until right before use.

This situation eliminates the possibility of an important safety practice with this high-alert medication—barcode scanning. If the crimped seam was over the back of the bag, there would be no problem scanning it. No errors have been reported, but there is an opportunity for mix-ups if the pharmacy must work around the problem and apply a barcode label to the bag. B. Braun told us that they are aware of this problem and are working to correct the situation.

Warning! Inconsistent Expression of Strength on Outsourced Anesthesia Syringes

Not all outsourcing companies that dispense prefilled anesthesia medication syringes label their products in the same way. This may lead to dangerous confusion when switching from one company to another, or when practitioners work in several different hospitals or ambulatory sites. Unlike with commercial manufacturers that provide sterile injectables, the FDA has not been holding outsourcers that perform sterile compounding to any standard for labeling their syringes. Per US Pharmacopeial Convention (USP) <7>, which commercial drug manufacturers must follow, the strength per total volume should be the primary and prominent expression on the principal display panel of the label, followed in close proximity by strength/mL enclosed by parentheses.

A compounded product from Cantrell Drug Company (red and black labeling at top in Figure 2) correctly lists the concentration per the USP requirement for strength per total volume as the primary and prominent expression (200 mg/10 mL). This is followed by the amount per mL, printed immediately below and less prominently (20 mg/mL). The PharMEDium syringe (at bottom in Figure 2) lists the strength in an opposite way, with the amount per mL as the prominent display (20 mg per mL). Both syringes are the same strength and hold exactly the same amount of drug.

A pharmacist and anesthesiologist reported that they found both types of syringes in the same pocket of the anesthesia cart in the operating room suite, which they thought could lead to a significant medication error if the strength was misidentified. Apparently, syringes from each outsourcer had been purchased without realizing the difference in the labeling.

Figure 1. Location of seam on the protective overwrap of B. Braun heparin premixed solutions.

Note. Color figure is available in the online version of this article.

Figure 2. Differences in labeling of compounded products.

Note. Color figure is available in the online version of this article.

The PharMEDium strength presentation, where 20 mg/mL is most prominent, can be confusing to a practitioner who is more familiar with all other commercial vials and prefilled syringes that list the amount per container most prominently (eg, 200 mg per 10 mL). Other outsourced syringes of anesthesia medications may also use this unsafe format. Evidently, this format is used at the request of anesthesiologists who administer medications IV based on the amount per mL listing.

We've contacted PharMEDium and FDA about the concerns with the label. We believe that the labeling standards for commercial manufacturers should also apply to outsourcers. We are aware that other outsourcers besides PharMEDium do label with the amount per mL as the primary display.

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