April 2017 ■ Volume 15 Issue 4

ISMP

Nurse AdviseERR®

Educating the Healthcare Community About Safe Medication Practices

What's in a generic name?

Clues about the drug's use and possible adverse effects

Many healthcare professionals, particularly pharmacists, know that a drug's generic name can often 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 generic 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 generic name can help healthcare 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 healthcare professionals realize that generic 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 generic (nonproprietary) drug names based on pharmacologic and/or chemical relationships.[1,2] For pharmaceutical companies, obtaining a generic name is required before bringing a new drug to the market. Today, there are 5 members of the USAN Council, including the American Medical Association (AMA), United States Pharmacopeia (USP), American Pharmacists Association (APhA), 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 generic 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, or both. Sometimes, the standard name stems used for generic 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 US include atenolol, bisoprolol, esmolol, metoprolol, and propranolol. While 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.

Table 1. Examples of differences between USAN and INN nonproprietary drug names[8]

USAN	INN
acetaminophen	paracetamol
albuterol	salbutamol
gly**BURIDE**	glibenclamide
meperidine	pethidine
rif**AMP**in	rifampicin
torsemide	torasemide

Another example is the group of drugs ending with the stem -oxetine used for antidepressants (**FLU**oxetine type). Examples of drugs with this name stem include

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SAFETY wires

Chlorhexidine mixed up with lidocaine oral solution. The ISMP National Medication Errors Reporting Program (ISMP MERP) database contains 14 reports of confusion between Hi-Tech Pharmacal's look-alike containers of chlorhexidine gluconate oral rinse 0.12% and lidocaine hydrochloride oral topical solution 2% (**Figure 1**). The light teal text color, small font size, and prominent barcodes on these labels contribute to visual similarity. If topical lidocaine is administered

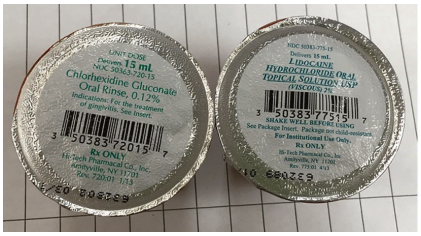

Figure 1. Look-alike containers of Hi-Tech Pharmacal's chlorhexidine rinse and lidocaine oral solution.

instead of the chlorhexidine rinse, anesthesia of the oropharyngeal area may occur, which can affect the gag reflex that protects the airway when swallowing.

In a report we recently received, chlorhexidine 0.12% was administered and ingested by a patient instead of lidocaine solution. No serious outcome was reported.

Most of the reported mix-ups have involved pharmacy dispensing and storage errors. (Similar packaging and mix-ups between unit dose cups of lidocaine oral solution and sulfamethoxazole and trimethoprim oral suspension from Hi-Tech Pharmacal have also been reported, and the company may offer other products with this look-alike packaging.)

Also, the US Food and Drug Administration (FDA) recently released a statement about rare but serious allergic reactions

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vortioxetine (**TRINTELLIX**), **FLU**oxetine (**PROZAC**), and **PAR**oxetine (**PAXIL**). These drugs are selective serotonin reuptake inhibitors (SSRI). They work by increasing levels of the neurotransmitter serotonin in the brain by blocking their reabsorption or reuptake. They are used to treat various psychiatric disorders such as depression, anxiety, and obsessive-compulsive disorder. They also share many of the same side effects.

Once the generic names are built using the appropriate stem and other conventions, occasionally the pharmaceutical company supplies a syllable or two that may be meaningful to the drug development process. For example, the multiple myeloma drug carfilzomib (**KYPROLIS**) includes the stem -zomib reserved for proteasome inhibitors and 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 generic drug names

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

Overlooked clues in generic drug names

Understanding the clues found in generic drug names is much like learning English vocabulary by studying Greek and Latin roots—learn what the stem means and you will have clues to help understand what the drug does and how it affects the body.[3] Unfortunately, not all healthcare 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 healthcare professionals may not associate the drug with potential adverse effects within a certain class of drugs. Some healthcare 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 naming system and importance of stems may not have been emphasized.

Despite this lack of training, it is more than likely that healthcare 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 proton pump inhibitors (antiulcer drugs); drugs with names that end in -parin are heparin derivatives; and so on. However, if healthcare practitioners 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 recognized simply from the drug name.

Please note, there are some exceptions to this rule. For example, the drug **ARIP**iprazole has the -prazole drug stem, which is affiliated with the proton pump inhibitor drug class as mentioned above. However, **ARIP**iprazole is actually an antipsychotic medication. So, we must emphasize that although drug stems may give important clues about the drug, it is imperative that all healthcare practitioners

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after the use of topical chlorhexidine (www.ismp.org/sc?id=2863), which can also occur if chlorhexidine rinse is used in the oral cavity. FDA noted that other prescription chlorhexidine gluconate products such as mouthwashes and oral chips already contain a label warning about the possibility of serious allergic reactions.

Normally, we would recommend purchasing one of these items from a different supplier, but it appears that Hi-Tech Pharmacal is currently the only supplier of these items in unit dose cups. We have contacted Hi-Tech Pharmacal, which is now owned by Akorn, and asked the company to take steps to reduce the risk of mix-ups between these drugs in unit dose cups. If you have these items in stock, we recommend taking steps to avoid mix-ups. Work with your pharmacy and ask them to add auxiliary labels to trays or cups that prominently list the drug names. Pharmacy may also consider purchasing bulk containers of one of the products and repackaging it in unit doses before dispensing, or have a contract packager prepare individual unit doses. The use of barcode scanning technology during stocking and administration is also recommended.

IVFE confused with IV iron (IVFe). The American Society for Parenteral and Enteral Nutrition (ASPEN) recently reported that IVFE, an abbreviation used for IV fat emulsion, has been confused with IV iron (IVFe), risking medication errors. Reports of confusion also appear in the ISMP National Medication Errors Reporting Program (ISMP MERP) database. ASPEN previously chose to use IVFE as an abbreviation for IV fat emulsion in its documents, as it was the term the US Food and Drug Administration (FDA) used to describe oil-in-water emulsions for intravenous (IV) administration. The FDA has changed the terminology from IV fat emulsion to the US Pharmacopeia term, lipid injectable emulsion; therefore, ASPEN is no longer using IV fat emulsion or its abbreviation, IVFE, in documents. The term lipid injectable emulsion is now used. You may see the official abbreviation in articles and standard documents (ILE since LIE

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look up and review drug information on any medications they are unfamiliar with before they prescribe, dispense, or administer them to patients.

How ISMP 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 (e.g., -farcept for interferon receptors, -vircept for antiviral receptors). New stems are constantly being created for novel pharmacologic categories of medications.[5] Exhaustive lists of the stems for healthcare professionals may not be helpful, nor are lists that describe the meaning of drug name stems in terms that may not be understandable to all healthcare professionals without extensive training in pharmacotherapy (e.g., phosphodiesterase-5 enzyme inhibitors for -afil [e.g., tadalafil]).

Instead, healthcare professionals should be provided with information about the stems associated with the most common drugs prescribed or administered, 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 a regular series of short features in this newsletter highlighting common drug name stems to promote their recognition. ISMP is borrowing the idea from an outstanding effort that is already underway in the French publication, *Prescrire International*, a 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] Look for the first ISMP feature about common drug name stems in the June 2017 issue and then about every other month thereafter.

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Worth repeating...

Possible reason for hyperglycemia in patients using an insulin pen

Individuals who teach patients with diabetes about insulin, particularly how to use insulin pens, need to be aware of an unusual situation that can happen once patients become familiar with the NovoFine Autocover disposable safety needle system that is used in many hospitals. With this needle system (**Figure 1**, on page 4), the user holds the outer cover of the needle system while it is screwed onto the insulin pen.

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did not seem appropriate), however, referring to the full term, lipid injectable emulsion, rather than using an abbreviation, is the safest course of action in hospitals. Healthcare professionals should avoid using the abbreviation IVFE entirely.

FentaNYL diversion alert. A pharmacist contacted us to let us know about a diversion and tampering incident that had occurred at his hospital, which was felt to be related to the labeling style of the West-Ward Pharmaceuticals fenta**NYL** 50 mcg/mL, 2 mL vial. The paper labeling extends to the top of the flip-top cap (**Figure 1**). This had been carefully pulled back, and the flip-top cap had been removed. Then, the fenta**NYL** medication had been withdrawn from the vial and replaced with sterile water for injection. The flip-top cap was then replaced and held in place by the label, which had enough adhesive to keep it in place, disguising the tampering and diversion. In fact, the label has enough glue to cause the vials to stick together in the 25-vial carton, sometimes resulting in torn or crinkled labels on vials that have not been tampered with. We contacted West-Ward but have not yet heard whether any changes are planned.

Figure 1. The fenta**NYL** label that extends above the flip-top cap was carefully peeled away, the medication was removed and replaced with sterile water, the cap was replaced, and then the label was pulled up around the cap to hide any signs of tampering.

Educate fluorouracil home infusion patients about accidental overinfusion. We recently received a call from a family member of a patient with cancer who was to receive a 7-day infusion of fluorouracil at home via an ambulatory elastomeric infusion pump. For an unknown reason, the entire infusion ran in over 4 days. The patient was very sleepy for the next 2 days and had "terrible diarrhea." Even though the infusion was empty, they waited until the patient's

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Newsletter also partially supported by an educational grant from NeoMed®

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The outer cover is then removed, exposing a plastic needle shield that covers the needle. As the device is held against the skin, the needle shield slides back, allowing the skin to be punctured, and the insulin is injected once the button is pressed. After the injection is complete, the shield slides back over the needle as it is removed from the skin and locks in place so the needle cannot be used again. It is a safety needle.

The Autocover safety needle is quite different than standard insulin pen needles that patients typically purchase at their pharmacy. Insulin pen needles for home use are usually not safety needle and do not employ a needle shield. However, these two needle systems can look similar, and patients may not recognize the difference. Both the Autocover safety needles and standard needle systems have an outer cover that, when removed, exposes either a retractable needle shield (Autocover safety needle, **Figure 1**) or a needle cap (standard needle, **Figure 2**). The Autocover needle shield is not intended to be removed prior to injection, but the needle cap on the standard needle must be removed before the injection to allow administration of insulin.

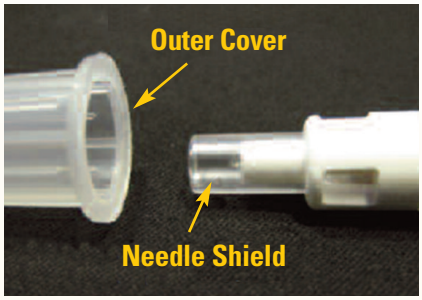

Figure 1. NovoFine Autocover has outer cover that must be removed, but the plastic needle shield slides back during injection.

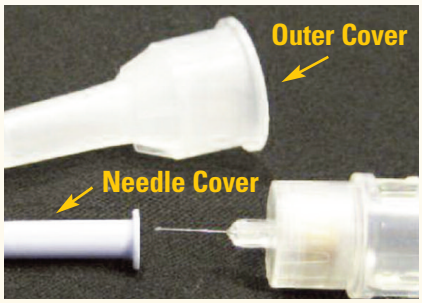

Figure 2. BD Ultra-Fine III, a standard non-safety needle for patients that use insulin pens at home, has clear outer cover and gray needle cap. Each must be removed prior to injection.

Recently, a hospitalized patient was receiving new insulin therapy with a NovoFine Autocover safety needle attached to the pen. Prior to being discharged, nurses and a certified diabetes educator (CDE) taught the patient how to use the insulin pen at home using the safety needle and instructed the patient to perform blood glucose testing four times a day. The hospital conducted home visits after discharge, and the patient reported elevated blood glucose levels to the nurse during a visit. When the nurse investigated, she realized the patient was not removing the cap from the pen needle because she thought it was the same safety needle used during her hospitalization. Consequently, she was not receiving any insulin since the needle never punctured the skin.

We first published an alert about this in our May 2009 newsletter. With the latest case, it is clear that the problem continues to exist, so the issue is ***Worth*** **repeating**. Patients who use Autocover safety needles in the hospital and are then switched to standard pen needles at home must be advised that there are two types of needle systems for pens. If they are using standard needles, they need to know to remove both caps. The hospital that reported the latest event has changed to non-safety needles when training patients to make sure they know how to administer insulin with the pen and needle they will use at home. All hospitals should verify which needle the patient will be using upon discharge and tailor the training to that needle whenever possible.

If blood glucose levels are elevated after injection, the patient should be reminded to consult a diabetes educator, pharmacist, or physician, who should review injection technique with the patient. Community pharmacists dispensing pen supplies should also educate patients regarding their proper use, and patients should question if the insulin pen needle is not what they expect.

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scheduled appointment 4 days later to report the mishap. The doctor hospitalized the patient and treated her with IV hydration. It's unclear why the antidote uridine triacetate was not administered, but the safety and efficacy of uridine triacetate initiated more than 96 hours following the end of fluorouracil or capecitabine administration has not been established. The patient was discharged after 7 days of hospitalization.

We are learning more about the pump issue that occurred, but this incident points to the need to educate patients with ambulatory infusion pumps about specific details in regards to how the pump works, what to expect over the course of the treatment, infusion rates, how long the infusion should last, how much should be left in the container each day, and the need to immediately report any incident to their care team should the container empty sooner than anticipated.

Dangerous delays have been known to occur because patients are often asymptomatic in the first few hours and days. But rapid identification of a fluorouracil overdose allows prompt treatment with the antidote to minimize serious side effects and the risk of a harmful or fatal outcome. Patients need to be educated about rapidly reporting events to their healthcare team.

Editors: Ann Shastay, MSN, RN, AOCN; Judy Smetzer, BSN, RN, FISMP; Michael Cohen, RPh, MS, ScD (hon), DPS (hon); Russell Jenkins, MD; Ronald S. Litman, DO. ISMP, 200 Lakeside Drive, Suite 200, Horsham, PA 19044. Email: ismpinfo@ismp.org; Tel: 215-947-7797; Fax: 215-914-1492.