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.

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 (SSRI). They work by increasing levels of the neurotransmitter serotonin in the brain by blocking their re-absorption 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 (KYPROSIS) 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). 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.5 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 -cilin 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 ARIPiprazole has the -prazole drug stem, which is affiliated with the proton pump inhibitor drug class as mentioned above. However, ARIPiprazole 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 continued on page 3—Generic name

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 continued on page 3—SAFETY wires
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. 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. 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. Look for the first ISMP feature about common drug name stems in the June 2017 issue and then about every other month thereafter.

References

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. The flip-top cap was then repositioned (Figure 1). This had been carefully pulled back, and the flip-top cap had been removed. Then, the fentaNYL medication had been withdrawn from the vial and replaced with sterile water for injection. The flip-top cap was then repositioned in place by the label, which had enough glue 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.

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 condition improved before repeating the infusion.

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 fentaNYL 50 mcg/mL, 2 mL vial. The paper labeling extending 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 fentaNYL medication had been withdrawn from the vial and replaced with sterile water for injection. The flip-top cap was then repositioned and held in place by the label, which had enough glue 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 fentaNYL 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.

References
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.

Recently, a hospitalized patient was receiving new insulin therapy with an 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.