The Often Mismatched Shoes of Healthcare: SNOMED vs. ICD-10-CM/PCS

By Ron Mills, PhD

The healthcare industry has spent millions of dollars implementing electronic health records (EHRs). Most EHR systems use concept dictionaries like SNOMED or a similar system for internally representing medical information. With the ICD-10-CM/PCS implementation making headlines, people have begun asking, "Why can't we just use the SNOMED codes for billing and avoid all that fuss with converting from ICD-9 to ICD-10?"

The reason why can be illustrated with an introduction to Imelda, the wife of the ruler of a small planet somewhat like ours. Imelda likes shoes, and her subjects like to give them to her; at the beginning of this story she has 7,000 pairs. She also knows something about the difference between "nomenclature" and "classification," which is key to understanding how SNOMED and ICD-10 are different. "Nomenclature" is the "N" in SNOMED. "Classification" is the "C" in ICD-10.

Defining Nomenclature

With 7,000 pairs of shoes, Imelda needed to be able to talk to her servants about them. Shoes can be described structurally (pumps, stilettos, slippers, boots) or by where they are worn (parties, state dinners, bedroom, tennis court) or by color (black, blue, red, gold) or material (leather, silk, canvas, diamond-studded) or by manufacturer, designer, year of acquisition, height of heel, degree of funkiness—the human brain is good at inventing types of distinctions. After all, every patient—oops, pair of shoes—is different, right?

Imelda's life was further complicated by the fact that her servants didn't all speak the same language. So starting with her favorite shoe descriptions, she invented a Standardized Nomenclature of Footwear (SNOFOO). Each important shoe concept, like "stiletto," was given a Footwear Identifier (FID), and the word or phrase for it in each of the servants' languages was associated with that FID. Imelda wanted to be sure that when someone used FID 24620, they meant "stiletto" the way Imelda meant it, even if they said it differently in their own language.

Or did they? When a new servant asked her how to tell if a shoe is "stiletto" as opposed to just "high-heeled," Imelda explained that the heel must be at least eight centimeters high with ground contact no more than a square centimeter. When the servant asked, "What is 'heel' and what is 'centimeter?'" Imelda went back to SNOFOO and added "is-part-of" and "measurements" and "is-a"—as in, "stiletto" "is-a" "heel" "is-part-of" "shoe." Pretty soon there were enough FIDs in SNOFOO so Imelda could decree that "Every concept FID is defined through its relationship FIDs with other concept FIDs," which at least cowed those pesky servants into silence if not answering their question.

On the other hand, having to buy every servant a laptop to access each shoe's Electronic Footwear Record (EFR) was a strain on her budget, though as long as the machines were put to "meaningful use"—communicating accurately about her shoes—Imelda was okay with it.

The Expansion of SNOFOO

With SNOFOO, Imelda could be confident that the EFR entered by a servant who only speaks Azerbaijani would be understood by another who only speaks Bengali, since the EFR would contain neither Azerbaijani nor Bengali, but consist solely of FIDs. Well, it did, until the official palace historian started writing such wonderful descriptions (in English) of the shoes Imelda wore each day, making subtle distinctions beyond SNOFOO's ability to capture them. So Imelda had to allow some free text in the EFR to preserve the subtleties. Before long, the servants were finding other justifications for free texting.

This would have bothered Imelda, except that after watching Jeopardy! she started to believe that computers would soon be able to understand the free text and translate it into some future Enhanced SNOFOO.

By this point, SNOFOO started to have many of the features of a natural language—circular definitions, multiple ways of saying the same thing, recognizable styles of expression—and needed a committee of experts to keep it pure. Imelda began to wonder if she wouldn't have been ahead of the game just to buy everyone English lessons.

Nevertheless, Imelda had a nomenclature: a standardized way of naming things. Using pick lists, she could enter into her computer:

> Bring me
>
> > Structure: ballet slippers
> > Material: silk
> > Color: gold with silver piping
> > Acquired: March 1998
> > Source: Duke of Hazzard

Doing so would allow whichever servant was on duty that day to know exactly which shoes she was talking about—though it might have taken hours to find them.

Defining Classification

While Imelda had more or less solved the problem of talking about her 10,000 pairs of shoes (admirers sent new ones every day), for her the big headache had become how to have her servants find them quickly when she wanted them.

Then, for her birthday, her husband Ferdie added a new room to the palace with 256 big bins, or "cubbyholes," as the servants preferred to call them. Imelda and her staff got right to work figuring out how to store the shoes. She soon realized that no single attribute sorted the shoes into 256 neat categories. Color, for example: the "black" cubbyhole would be overflowing onto the floor while the "puce with lime heels" would have only one pair in it. After nine tries, Imelda finally got a scheme that worked well enough, so she had it written down as Imelda's Classification of Footwear (ICF-9). Copies were distributed to the full-time shoe servants—they called themselves "cubbyholers"—and pretty soon they were forming groups like the Cubbyholers of Imelda Meeting Annually (CHIMA) to promote "correct cubbyholing."

ICF-9 started by determining what kind of shoe it was (pump, high-heel, sneaker, slipper, etc.). Then, depending on the kind of shoe, it was further classified by some other attribute—color for pump, height for high-heel, intended use for sneaker, material for slipper, and so on. Of course, there were always leftovers at the bottom of the hierarchy requiring the designation of some Not Elsewhere Classified (NEC) bins—informally known as "garbage cubbyholes"—as well as some pairs (her bronzed baby shoes, for example) that refused to be nicely classified anywhere. Furthermore, arguments arose (exactly what percentage of nylon in a silk/nylon blend disqualifies the shoes from going into the "silk" cubbyhole) that had to be resolved. The decisions were codified in the official Cubbyholing Guidelines or, less formally, in a quarterly publication of cubbyholing advice called *Cubbyholing Clinic*.

A Better Classification System Emerges

The years passed and the shoes kept pouring in. Eventually the floor of the Cubbyhole Room started sagging beyond repair, so Ferdie built Imelda a big new room with 2,048 cubbyholes.

What an opportunity! Now she could finally fix the things about ICF-9 that were out of sync with the times. Flip-flops, for example. When Imelda designed ICF-9 and was limited to 256 cubbyholes, only children and gurus wore flip-flops, so they only had one cubbyhole. But now that bin was seriously overflowing. So Imelda sat down and designed a modern cubbyholing system which updated the classification based on current shoe fashions and the latest understanding and practice of shoe wearing. She called it "ICF-10".

Her cubbyholers were a little intimidated by the new system at first, but they had to cope or find a new job. It's not as if they had a choice. They may have had to look at a shoe more carefully—flip-flops, for example, went into eight different cubbyholes depending on sole material and thong material—but the process of cubbyholing a shoe in the new classification system wasn't much different, so they were confident they could do it. No, it was the shoe manufacturers who gave Imelda grief. It turned out that they were using a shoe's cubbyhole number to price their shoes and track sales.

They whined, "Our databases only have three characters for the cubbyhole number." They complained, "Our store shelving policies are all in terms of ICF-9. Who's going to foot the bill to rewrite them?" They lobbied to stay with ICF-9, saying "More cubbyholes isn't going to make shoes any better." They tried to make fun of her work, saying "Can you believe ICF-10 has different cubbyholes for fuzzy slippers with cute animal faces on them versus those with super-heroes!"

Imelda tried to help them out. She figured if they could map the ICF-10 cubbyhole number back to the ICF-9 number they were used to, they could keep using their systems while freeing her to move on to something better. So she created the ICF-10 to ICF-9 Cubbyhole Equivalence Map—10-to-9 CHEM for short. But they kept insisting that they had to convert all their ICF-9 data to ICF-10. Imelda went hoarse explaining that "you can't make up detail you don't have." She even tried giving them an extra year to get ready, but in the end, it just meant another year of whining and complaining.

Why SNOFOO Won't Do to Classify a Shoe

Then someone got the bright idea: "Why don't we just use SNOFOO?—after all, we're already describing each shoe in its EFR, so its FIDs are already coded. Just have the computer spit out the new cubbyhole number!"

What had happened to SNOFOO in all this? The SNOFOO folks had dutifully kept up with the task of assigning new FIDs to the concepts used to describe shoes (including 103449 "Iron Man," 103450 "The Hulk," to go with 1333 "slipper" and 86205 "fuzzy"). In fact, there were now over 100,000 FIDs, which the EFR vendors were free to include in their pick lists as they saw fit.

But Imelda had only 2,048 cubbyholes. She called a conference. The SNOFOO delegates said that rarely is a pair of shoes represented by just one FID (except, of course, FID 1, "footwear"). Take, for example, proposed ICF-10 cubbyhole 127: "Hiking boots, brown or tan, hooks above eyelets, laces unspecified." In one vendor's EFR it gets FIDs "boots," "hiking," "brown," "laced," "partly hooks"—in another's it gets FIDs "cowhide," "sport," "ankle-support," "rubber sole," "steel-reinforced eyelets." A document linking possible SNOFOO-based descriptions of shoes to ICF-10 cubbyholes—if it could even be drawn up in one lifetime—would go on to millions of pages.

The CHIMA delegates said, "Classification is an art, and it requires understanding and discipline. Our cubbyholers are trained to read an EFR and find the correct ICF-10 cubbyhole with 99 percent accuracy. If we couldn't do it, Imelda would be angry and we would be out on the street."

The vendor delegates said, "Give us a big enough grant and your EFRs. We'll put them in the cloud and use Big Data analytics and Natural Language Processing in a machine learning paradigm to relate EFR ontologies to cubbyhole designations. We'll achieve 40 percent accuracy in the first year, increasing to 98 percent in ten years."

What did Imelda do? We haven't yet heard. But we did hear a rumor that she was considering giving away all the shoes and taking up a new career in health information management, which she expected would be simpler, more rational, and less contentious.

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