



Getting to the 'route' of the problem: Oral and IV doses differ

Doses of some medications need to be adjusted when converting from one route of administration to another, particularly when changing from an oral to intravenous form of the same drug. Many drugs have oral and parenteral doses that are the same, but doses that are not the same are substantially different due to wide variances in absorption. If a necessary dose adjustment is not made, a patient could receive a fatal overdose, as did a young child with myasthenia gravis who was switched from oral **PROSTIGMIN** (neostigmine) to a parenteral form, without lowering the dose appropriately.

Fortunately, we also have many examples in which an alert nurse or pharmacist recognized a prescribing error and corrected the error before the wrong dose was administered. In one of the more recent examples, a physician prescribed **LOPRESSOR** (metoprolol) 50 mg IV for a patient—

a typical oral dose, but ten times higher than the recommended IV dose for this beta-blocker. Both a nurse and pharmacist recognized the error and the order was changed to the recommended IV dose.

An abbreviated list of drugs with oral and IV dose differences appears in the table below to illustrate just how different oral and IV doses of the same medication can be. Some physicians may not be aware of these differences, as attention-grabbing warnings about the need for dose adjustments on package labels and inserts are often inadequate, unavailable to the prescriber, or nonexistent. If a medication is changed from an oral to parenteral route of administration (or vice versa), don't assume that an equivalent dose is appropriate. Take the time to speak with a pharmacist or reference the drug in a reliable resource to check the dosing.

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Examples of drugs with significant differences between oral and IV dosing*

Drug	Single Oral Immediate-Release Dose (adult)*	Single IV Dose (adult) Unless Otherwise Specified*
diltiazem (CARDIZEM)	30 to 90 mg	20 mg
enalapril (VASOTEC)	5 to 40 mg	1.25 to 5 mg
HYDROMORPHONE (DILAUDID)	2 to 4 mg	0.4 to 0.8 mg
labetalol (NORMODYNE, TRANDATE)	100 to 400 mg	0.25 to 0.5 mg/kg
levothyroxine	150 mcg	75 mcg
metoprolol (LOPRESSOR)	50 to 100 mg	5 to 20 mg
morphine	5 to 30 mg	2 to 10 mg
niCARDIPINE (CARDENE)	20 to 40 mg	0.5 to 2.2 mg/hour infused
propranolol (INDERAL)	10 mg to more than 100 mg per dose depending on diagnosis and frequency	1 to 3 mg
verapamil (CALAN)	80 to 120 mg	5 to 10 mg

Dosages obtained from most current editions of *Micromedex* and *Facts and Comparisons*

*Adult doses are illustrative only to show how different oral and IV doses can be. The doses are not exact equivalents or appropriate for all circumstances without consulting drug information resources and clinical experts.

All is not as it seems...

U see IU, I see IV. A nurse sent a request to pharmacy for "the IV form of vitamin E" because the patient was not taking oral medications. Before the pharmacist could respond, the nurse called to ask if she should just draw the fluid out of the capsule. When told that administering the drug IV would be inappropriate, the nurse asked why the drug had been prescribed as either IV or PO, referring to the order that

Vitamin E 200 IU PO daily

appears above. "IU" is an abbreviation for international units; its use has led to errors, so it is included in the Joint Commission's "Do Not Use" list of error-prone abbreviations associated with the National Patient Safety Goal 2B. While the Joint Commission suggests writing out "international units," some hospitals have allowed practitioners to just use "units" as an acceptable designation for "international units." In any case, "IU" should never be used, as it can look too much like "IV."

nicecatch



Look-alike drug names. A physician ordered **ZEGERID** (omeprazole) 40 mg orally each day for a patient with

gastric ulcers, but a pharmacist misread the handwritten order as the more familiar anti-hypertensive, **ZESTRIL** (lisinopril), in part because Zegerid had been misspelled as "Zegrid." The drugs have overlapping dosage strengths (20 mg, 40 mg) and are both administered orally once daily, increasing the risk of mix-ups. The error was detected when the nurse called the pharmacist because she was concerned about giving Zestril to a patient who was hypotensive. Matching the patient's condition with the drug's indication can detect prescribing or dispensing errors, as in this case.

Free CE Credit (1 hour) for the 2006 July-December issues of **Nurse Advise-ERR®** is now available at: www.ismp.org/Newsletters/nursing/newsletterCE/default.asp.

Worth Repeating...

Oral syringes: A simple, powerful way to prevent patient harm

In our Premier Issue of **NurseAdvise-ERR®** in April 2003, we told the story of an infant who received **AUGMENTIN** (amoxicillin and clavulanate) oral suspension by the intravenous route. The nurse had drawn the oral suspension into a parenteral syringe, but before she was able to administer the medication, she was called away from the room to attend to an emergency. Without knowing that the child's IV antibiotic had just been switched to an oral antibiotic, the infant's mother accidentally gave her child the medication via a saline lock, as she had seen other nurses do previously. Although the infant experienced cardiac arrest, he was successfully resuscitated and suffered no permanent harm. Along with other important system enhancements, we pointed out that this near tragedy would have been prevented if the oral solution had been drawn into a specially designed oral syringe that cannot be attached to an IV port or catheter. Since then, we have highlighted several other instances in which oral or enteral medications have been drawn into a parenteral syringe and accidentally administered intravenously (see our February 2006 and August 2006 newsletters).

Errors continue to happen because oral syringes are not being used when drawing up oral solutions.

Although quite a few nurses who responded to our 2005 readership survey reported that these articles in **NurseAdvise-ERR®** had prompted them to stock oral syringes on patient care units, unnecessary errors continue to happen, as this recent example illustrates.

A patient was admitted with a percutaneous endoscopic gastrostomy (PEG) tube in place following surgery for a maxillary malignancy. When she requested pain medication, a nurse reviewed the patient's medication administration record (MAR) to see

what was prescribed. She noticed that two other routine medications—one to be administered enterally and the other IV push—were also due at the same time. First, she prepared the routine IV push medication in a parenteral syringe. She then prepared the routine enteral medication by crushing a tablet, mixing it with water, and drawing the contents into a parenteral syringe, although the dose was to be administered via the PEG tube. She also drew 15 mL of the patient's pain medication, **LORTAB** elixir (acetaminophen 500 mg/15 mL, hydrocodone bitartrate 7.5 mg/15 mL) into a parenteral syringe. The nurse proceeded to the patient's bedside and mentally reviewed the doses and names of each medication to be administered. She then injected 1.5 mL of saline to flush the patient's IV line and proceeded to administer both the IV push medication and the Lortab elixir intravenously before flushing with the saline solution. After administering the remaining enteral medication correctly, the nurse recognized that the Lortab elixir had been administered IV rather than via the PEG tube. Fortunately, the patient did not experience an adverse effect.

This error, and so many others in which patients have been less fortunate, could have been averted if the oral medication—Lortab elixir, in this case—had been drawn into an oral syringe. Stocking oral syringes in convenient areas on patient care units and using them for all oral/enteral liquid medications is relatively simple and inexpensive; yet, it's a powerful error-reduction strategy that will clearly reduce the risk of patient harm. So is bringing the patient's MAR to the bedside so the route of administration can be verified before drug administration, as well as labeling oral syringes with the drug name, strength, and route.

safetywire



Open packages at bedside.

Once medications have been removed from their packaging, it is often more difficult to identify them. An unlabeled medication is at far greater risk of being mixed up with another drug than one that remains in its package. Additionally, once removed from its package, the drug cannot be returned to stock or to the pharmacy if it is unused, resulting in wasted resources. Thus, medications should not be removed from their unit-dose packages in advance of the time they are to be administered. The following example illustrates the importance of keeping medications in their packaging until the time of administration. A night-shift nurse was preparing medications for three patients when a female patient with Parkinson's disease requested aspirin. After confirming the order, the nurse placed two aspirin tablets into another cup. She then picked up all four cups into which she had placed the medications and headed for the patients' rooms. Remembering that the patient who requested the aspirin frequently complained about getting her medications late, the nurse administered that patient's medication first. She had verified the patient's identity using two unique identifiers, but the nurse soon realized that she had switched the cups and given the woman who had requested aspirin, the morphine sulfate tablets intended for another patient with cancer. The patient was carefully monitored and only experienced somnolence. It is always safest to keep medications in their packages and to administer only one patient's medications at a time.

Nursing again tops the December 2006 Gallup Poll as the most honest and ethical profession!

Happy New Year!

In the News: Tragedy brings a measure of good

Julie Thao, the Wisconsin nurse who was facing criminal charges in the tragic medication error-related death of a young mother, Jasmine, entered a "no contest" plea in court in December to two misdemeanor counts of illegally administering prescription medications, after which the state dropped the felony count—a more serious charge that could have led to jail time. More than three dozen nursing colleagues were on hand to support Julie, who repeatedly broke down and expressed deep anguish and remorse about the error. (See the November 2006 newsletter for details about the error and the felony charges.)

One day before her court appearance, the Wisconsin Department of Regulation and Licensing suspended her license for 9 months, retroactive to July 2006. The Department considers the suspension relatively short, as the members were influenced by Julie's positive work performance reviews for the past 13 years. Julie's working hours were limited to no more than 12 hours per 24-hour period or 60 hours per week for 2 years (although there are no work hour limitations for other nurses in the state, or for Julie after 2 years). The state court placed Julie on probation for 3 years, during which time she is

banned from working in critical care settings, including birthing units. The licensing department is also requiring Julie to take classes on preventing medication errors and to make presentations about what she learns to help others avoid medication errors.

This last requirement is certainly no burden to Julie. As with many other healthcare professionals who have been involved in a harmful error, Julie has a profound desire to do as much as possible to help prevent similar tragedies. To facilitate this desire, the Chairman of TMIT (Texas Medical Institute of Technology), Charles Denham, MD, has most generously offered Julie a yearlong paid fellowship to join his team as they work with patient safety leaders in the US to further the adoption of best safety practices. As part of the fellowship, Julie will also be able to spend time at ISMP, learning about medication safety and working with our staff to reduce the risk of medication errors nationwide. Along with Julie, our deepest sympathies go out to Jasmine's family. In court, Jasmine's mother noted that she sincerely hopes her child's death will not be in vain. Perhaps the healing can now begin in earnest for both Julie and Jasmine's family as a measure of good comes from this terrible tragedy.

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Incidentally, with the metoprolol dosing error, the ordering physician had initially refused to change the dose, telling the nurse to "Just give it." The nurse felt that the dose could harm the patient and refused. Independently, a pharmacist had called the physician, also

to request a dose change. The request was similarly denied, but after telling the physician that the prescribed dose might be fatal, the doctor ordered a more appropriate IV dose. Fortunately, these professionals stood their ground, likely preventing serious patient harm.

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Report medication errors to ISMP at 1-800-FAIL-SAF(E).

► Special Announcements

► **ISMP teleconference.** Please join us for our first teleconference of 2007, **Gaining Physician Compliance to Your Patient Safety Initiatives**, to be held on **February 22, 2007**, from 1:30-3:00 p.m. EST. ISMP Medical Director and trustee **Russell Jenkins, MD**, will explore how to win, not just enforce, physician compliance to organizational safety goals, the traits necessary for physician safety champions—clinical credibility, communication skills, and a positive and contagious attitude, for example—and how champions can break down the barriers to physician engagement. Visit www.ismp.org/educational/teleconferences.asp to register.

► **Space filling up fast!** Registration for Series I of the **ISMP Rural Hospital Medication Safety Connection** is full, but we are still accepting registrations for Series II (a repeat of Series I), which begins on **February 6, 2007**. This collaborative, uniquely tailored to rural hospitals, offers a comprehensive tool set, live interaction with ISMP experts via audio-conferences, and more! Visit www.ismp.org/Consult/rural-hospital/default.asp to register.

► **Joint Commission field review.** Proposed revisions to Medication Management Standards MM 4.10 and 8.10 have been posted for field review until **January 24, 2007** (www.jointcommission.org/AccreditationPrograms/Hospitals/Standards/FieldReview/mm_stds_fr.htm). The revisions respond to concerns expressed by emergency department and radiology practitioners about timely care, management of urgent situations, and efficient deployment of manpower when requiring a pharmacist to review medication orders prior to administration in these settings.

► **ISMP Fellowship.** ISMP is now accepting applications from nurses, pharmacists, or physicians for the 2007-2008 12-month **Safe Medication Management Fellowship** that commences summer 2007 in Huntingdon Valley, PA (near Philadelphia). All applications must be received by **March 31, 2007**. For more information, please visit www.ismp.org/profdevelopment/managementfellowship.asp.

Happy New Year!