



Nurse Advise-ERR™

Educating the healthcare community about safe medication practices

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Maximize safety when titrating vasopressor drugs

Would you accept the following order: “LEVOPHED drip, start at 8 mcg/min and titrate to systolic BP greater than 90”? If so, consider the following event.

An ICU nurse titrated an IV dose of Levophed (norepinephrine bitartrate) up to 38 mcg/minute to maintain a patient’s systolic blood pressure greater than 90 mm Hg. This rate was maintained throughout the night. By morning, the patient had developed irreversible ischemia in several toes from the drug’s peripheral vasoconstrictive effects. Gangrene developed, and the affected toes had to be amputated.

Excessive vasoconstriction from vasopressor drugs can lead to cardiac dysfunction and peripheral vascular ischemia. Additional factors may also contribute to the problem, such as concomitant administration of other medications with similar modes of action. Patients and family members may desire full heroic measures regardless of the potential for adverse consequences. And if the patient is dehydrated, as in the case

above, or has preexisting circulatory problems, the deleterious effects of vasopressor drugs can be increased.

If you work in critical care, you’re probably used to seeing such “titrate to effect” orders for vasopressor drugs, even on your preprinted order forms. But accepting an order to titrate a vasopressor drug without dose limits is unsafe.

The problem is, drug information references offer little help in determining a maximum dose at which desirable cardiac effects are no longer apparent but adverse peripheral effects are likely. For example, in reputable drug references, dose ranges for Levophed were found to be as high as 210 mcg/minute, with only a brief warning about possible adverse effects. In other references, no maximum dose is listed for titrating the medication. The same may be found with other titrated drugs like epinephrine and phenylephrine.

See **Check it Out!** for suggestions on how to safely manage titrated vasopressor drugs.

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check it out! ✓✓✓✓

To manage titrated vasopressor drugs safely, follow these suggestions.

- ✓ **Ask pharmacists** to gather as much information as possible about safe dose ranges for vasopressor drugs that are titrated at your practice site. Have a multidisciplinary team of nurses, pharmacists, and physicians set dose limits for each titrated medication. Notify prescribers if doses exceed these limits.
- ✓ **Require physicians to acknowledge** a titrated medication that continues at or above the dose limit by rewriting the order every 24 hours, and listing a new dose limit at which notification is required.
- ✓ **Include maximum dose limits** on preprinted orders, protocols for titrated medications, internal reference materials such as nursing IV guidelines, medication administration records, and solution labels.
- ✓ **Post dosing charts** to help nurses determine infusion rates and avoid the risk of a calculation error.
- ✓ **Assess peripheral circulation** frequently. Include the frequency of assessments and specific assessment parameters (e.g., color, temperature, pulse, edema) on related preprinted or standardized order sets.
- ✓ **Establish minimum doses** for titrated medications to signal possible discontinuation when a drug is no longer needed.
- ✓ **Administer titrated medications through “smart” pumps** that will alarm when dose limits are exceeded to remind nurses to call the physician. See page 2 for more information about “smart” pumps.


safetywire

⚡ Don’t accept incomplete verbal orders. A nurse took a verbal order to “Increase LASIX to 40 an hour” for a patient who was receiving a furosemide infusion (10 mg/mL). The prescriber had actually wanted the solution to infuse at 40 **mg** an hour, but the nurse thought he wanted to run the infusion at 40 **mL** an hour. For nearly 15 hours, the patient received 400 mg of furosemide/hour, a 10-fold overdose, before the error was discovered. Luckily, the patient’s potassium level remained within normal limits, and he did not suffer hearing loss or other harm. To prevent errors, do not accept incomplete orders. Write each verbal order directly on the patient’s chart and **read** it back to the prescriber for verification. This differs from simply **repeating** the order back to the prescriber before you transcribe it onto

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did you know...

New “smart” pumps can alert you to programming errors?

 Using new technologies, such as computers to prescribe medications and bar codes to administer medications, will undoubtedly reduce the risk of errors. Unfortunately, most hospitals are not yet using these technologies. But even when these technologies are fully implemented, they will do little to prevent serious errors due to misprogramming of IV infusion pumps. Thus, errors like this one will still be possible:

A nurse accidentally set an infusion pump to deliver an infant’s total parenteral nutrition (TPN) solution at 130 mL/hour instead of 13 mL/hour. While she had intended to program the pump at 13.0 mL/hour, the decimal point key failed to engage when she pressed it. (Setting the pump at 13, not 13.0, would have been safer.) Thus, the infant received 130 mL for about an hour before the error was noticed. The baby’s glucose level rose to 363 mg/dL, so the TPN infusion rate was decreased for several hours. Fortunately, the infant suffered no permanent harm.

For about a year now, new “smart” infusion pumps have been available to warn nurses about these types of programming errors so that they can be corrected before an infusion is started. This new generation of

“smart” pumps turns a traditional IV pump into a computer capable of intercepting and preventing wrong dose/wrong infusion rate errors, especially those due to misprogramming, miscalculation, or an inaccurately prescribed dose or infusion rate.

For each IV solution with a standard concentration, dose limits can be set in the pump and individualized for each patient type (e.g., adult, pediatric, neonate) or disease state (e.g., chemotherapy). Then, when the pump is being programmed, an alert will appear if the infusion rate does not fall within the dose limits. Some pumps also offer compatibility information, special infusion directions, and other reminders. Most important, these pumps are easy to use – they require no change in your current workflow and no more training than needed with other pumps.


To learn more, visit the websites of these “smart” pump vendors:

- Alaris Medical Systems (MEDLEY) at www.alarismed.com
- Baxter Healthcare Corporation (COLLEAGUE CX) at www.baxter.com
- B. Braun (OUTLOOK) at www.bbraunusa.com.

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the order form – the latter will not uncover transcription errors. Don’t hesitate to ask prescribers to speak slowly, spell the drug names, and tell you the indication for each drug. Always pause before you read back the order to ensure that it’s complete and fully understood. Even though “read back” of verbal orders is required in the Joint Commission National Patient Safety Goals, it may not become a habit quickly. But here’s another error to remind you just how important it is to accept only complete verbal orders, and to read back your transcription to confirm your understanding: After an 18-month-old child was admitted to the ED, a physician told the nurse to “give the kid 0.8 of morphine.” The nurse accepted this incomplete order and did not transcribe it or “read back” her understanding of the order. Sadly, she misinterpreted the order and gave the child 0.8 mL of morphine from a 10 mg/mL syringe, not 0.8 mg as the prescriber had intended. Thus, the child received 8 mg of morphine, a massive overdose that led to her death.

Vexing vaccines

 To prevent or attenuate complications from chickenpox, varicella-zoster immune globulin should be given to susceptible pregnant women or others at elevated risk for severe disease within 4 days of significant exposure. However, some pregnant women have accidentally received the varicella virus vaccine (VARIVAX), which is contraindicated in pregnancy. Infection with varicella-zoster virus during the first half of pregnancy may result in congenital abnormalities in 2% of exposures, characterized by limb atrophy, extremity skin scarring, eye involvement, and brain damage.

Since 1996, the CDC has been encouraging reports of immunizations that occurred before or during pregnancy. Among 600 reports received, 22 cases involved errors in which the vaccine was given to women who should have received the immune globulin. In some cases, poor understanding of the products’ indications was at play. Varicella-zoster immune globulin has not been found to prevent chickenpox; it helps prevent complications of the illness in the mother, not protect the infant. But in most cases, similarities in the products’ names led to accidental mix-ups.

Mix-ups between the immune globulin and vaccines for rabies and Hepatitis B have also been reported. It’s safest to have pharmacy dispense vaccines and immune globulin as needed.

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To report medication errors to ISMP, please call 1-800-FAIL-SAF(E).

Learn More About Us

The Institute for Safe Medication Practices (ISMP)

Who We Are

We are a nonprofit healthcare agency comprising pharmacists, nurses, and physicians. Founded in 1994, our organization is dedicated to learning about medication errors, understanding their system-based causes, and disseminating practical recommendations that can help healthcare providers, consumers, and the pharmaceutical industry prevent errors.

Who We Are NOT

We are not a governmental, regulatory, licensing, inspecting, or accrediting agency. While we work collaboratively with these types of agencies to influence medication safety, we do not set healthcare standards or require individual organizations to implement the recommendations we make.

How We Are Funded

As a nonprofit agency, we rely on charitable donations, unrestricted grants, subscriptions to our newsletters, and fees from our consulting and educational services. We are not funded by the pharmaceutical industry and do not accept advertising in any of our publications.

How We Learn About Medication Errors



Over 25 years ago, we started a voluntary error-reporting program to learn about medication errors that were happening across the nation. Today, the United States Pharmacopeia, in cooperation with ISMP, operates this program, now called the Medication Errors Reporting Program (MERP). Each year, hundreds of healthcare professionals trust us enough to report errors to this program, solely to help us learn about errors, understand their causes, and share the “lessons learned” with others. You, too, can report errors through our website (www.ismp.org), by email (ismpinfo@ismp.org), or by calling **1-800-FAIL-SAF(E)**.

How We Keep Error Reports Confidential



While we share stories about medication errors in our publications and through other educational efforts, we have never disclosed the specific location of an event, the people involved, or the person who reported the error. When necessary, less important details about an error may be changed to ensure that inadvertent recognition of the error is not possible. In addition, if healthcare facilities seek our advice about a medication error or other medication safety issues, facility-specific recommendations are not disclosed publicly, even in a blinded manner.

How We Learn about Error-Reduction Strategies



Many years of analyzing medication error reports have enabled us to suggest credible error-reduction strategies. We are in constant contact with an advisory panel of practicing healthcare professionals, researchers, and experts in human factors and medication safety, who collectively help us offer evidence-based and practical error reduction-strategies that work. In addition, our staff spends considerable time in healthcare facilities learning first-hand about innovative medication safety practices so we can share these ideas with others.

What's Available On Our Website

We offer a wide variety of free educational materials and services on our website (www.ismp.org):

- Special Medication Hazard Alerts
- Searchable information on a wide variety of medication safety topics
- Answers to *Frequently Asked Questions* about medication safety
- FDA Patient Safety Videos
- Three *Pathways for Medication Safety Tools*:
 - a model strategic plan for medication safety
 - risk assessment tools and questions for nurses and others
 - readiness assessment for bedside bar coding.
- White papers on bar-coding technology and electronic prescribing
- A monitored *Message Board* to share questions, answers, and ideas.

Other Ways We Can Help

Over the years, we've developed numerous publications, programs, and tools designed to help healthcare professionals prevent medication errors. For example, we:

- publish three professional newsletters and one consumer newsletter (collectively reaching millions of readers)
- conduct frequent educational programs, including teleconferences, on medication safety issues
- offer posters, videos, patient brochures, books, and other drug safety tools
- conduct on-site risk assessments of medication safety in healthcare facilities.

You can trust ISMP to be an expert source of medication safety information.