IV infusion therapy in the long-term care setting: Not without resident safety risks

Skilled long-term care (LTC) facilities are treating more short-stay residents and provide increasingly more complex and specialized medical services for residents after discharge from a hospital. As incentives drive less complex care to home care service providers, the range of skilled services provided in LTC is expanding to encompass more post-acute care residents. As a result, intravenous (IV) infusion therapy in LTC facilities is becoming more common in order to provide continuity of care for residents with complex clinical needs.

Risk of IV Infusion Errors

Infusion therapy is an effective method of delivering medications, nutrition, and fluids and electrolytes. However, administering solutions by the IV route can be challenging and error-prone in LTC facilities given limited resources to purchase state-of-the-art equipment, such as smart infusion pumps with dose-checking software, and a shortage of nurses with current training, skills, and experience to administer the solutions and monitor the resident’s response to infusion therapy. Even when infusion therapy services are outsourced to an external provider, the provider staff may lack crucial information about the residents to adequately monitor their response to therapy or identify potential errors before they impact the resident.

Reports of medication errors to the ISMP National Medication Errors Reporting Program (ISMP MERP) have consistently demonstrated that harmful errors often involve the IV route of administration. Infusion therapy poses risks because of its inherent complexity, its requirement of multiple steps to prepare and administer the infusions, and the immediate therapeutic effects of the medications and fluids given by this route. Another risk factor is that some IV infusions contain high-alert medications, such as cardiac medications, opioids, and parenteral nutrition (PN), that have the greatest potential to cause harm when misused. An example of an error in a LTC facility involving PN follows.

Case Report of a PN Error

A 55-year-old woman with a history of Crohn’s disease, malnutrition, and recurrent *Clostridium difficile* was discharged from a hospital to a skilled LTC facility. She had been receiving PN in the hospital, and her physician provided orders for the therapy to continue in the LTC facility. After 12 days of PN, the resident became visibly distressed with diffuse body spasms, cramps, and a rapid heart rate. An electrocardiogram (ECG) revealed sinus tachycardia with a prolonged QT interval. The resident also exhibited a positive Chvostek’s sign—tapping the face over the facial nerve produces a twitch due to nerve hyperexcitability often caused by low calcium blood levels. Bloodwork was drawn, which revealed low serum magnesium, total calcium, and ionized calcium levels. Additional IV fluids and numerous doses of IV magnesium sulfate and calcium gluconate were required to return her levels to normal. Fortunately, the resident fully recovered.

Further investigation revealed that the infusion pharmacy supplying the PN solution omitted the prescribed daily 9.6 mEq of calcium gluconate and 16 mEq of magnesium.

---

**SAFETY wires**

**Insulin pen error.** A journal article published last year discussed the use of an improper injection technique with an insulin pen that led to elevated blood glucose levels in two patients (Shah A, Sullivan MM, Rushakoff RJ. A new “twist” on insulin pen administration errors. *Endocr Pract*. 2014; 20(6):617). In both cases, the patient dialed to the correct prescribed amount of insulin units using the LANTUS SOLOSTAR (insulin glargine) insulin pen. Each patient then properly completed the next step and inserted the needle under the skin. However, instead of pushing the purple button at the end of the pen to inject the insulin, both patients twisted the dial back down to zero (Figure 1). By dialing back down to zero, they believed the twisting mechanism was injecting the insulin. Neither patient received insulin using this method.

![Figure 1. The correct way to administer a dose of insulin using the Lantus SoloStar pen is to dial the correct dose (top) and then push the purple button once the needle is below the skin (bottom).](image-url)

The Lantus SoloStar insulin pen (and others) is designed to be twisted “up or down” until the user has dialed the device to the correct amount of insulin to inject. But the button must be pushed to inject the insulin. This type of error can easily occur if staff continued on page 2— **SAFETY wires**

---

*In infusion therapy*
sulfate during these intervening 12 days. The nurses at the LTC facility were not familiar with the pharmacy PN label and did not know to check it carefully against the PN orders prior to hanging each bottle to ensure the solution included all the ordered ingredients. Although the error originated in the pharmacy, LTC nurses could have detected the error had the verification process of comparing the label to the order been carried out.

**Causes of IV Infusion Errors**

Errors involving IV infusion therapy arise from a variety of contributing factors. Some events are caused by factors specifically associated with the medication or solution being infused. Others are caused by system-related factors that are common in LTC facilities.

**Limited competency evaluation.** Due to high rates of staff turnover in LTC facilities, it may be difficult to ensure nurses are competent and have the requisite skills, knowledge, and abilities to administer IV infusions. Maintaining ongoing competency is also a concern if the LTC facility intermittently provides care to residents requiring infusions.

**Variability of infusion pumps.** Infusions are often administered using an infusion pump that is the property of the infusion provider, not the LTC facility. Due to insurance demands, there may be more than one infusion provider that services each facility, and thus more than one type of infusion pump in use. This makes it difficult to educate nurses about each pump’s programming and safety features.

**Misprogramming infusion pumps.** Errors when programming the infusion pump are common in healthcare. The nurse may initially choose the wrong settings, allow the pump to default to an unsafe setting, or inadvertently reprogram the rate of infusion if unfamiliar with the pump.

**Confusing infusion labeling.** The pharmacy label may be a clue that the infusion has been prepared erroneously if it states exactly the contents of the infusion, which differ from the order. However, some labels, such as those for PN, present this information in a manner that is complex and difficult to understand or compare to the order.

**Insufficient evaluation of infusion providers.** Not all LTC pharmacy providers are equipped or capable of providing infusion therapy, so the LTC facility may need to enter into a contract with an alternative pharmacy provider for infusion therapy. These services can include the product, pharmacy clinical monitoring, physician communication, and medication administration services through pharmacy-provided nurses. The LTC facility is ultimately responsible for assuring the quality of these services prior to and during use, which can be difficult for LTC staff if they lack the expertise to evaluate the service.

**Miscommunication with pharmacy providers.** Absent communication or miscommunication between the infusion pharmacy provider and the LTC facility has been at the root of infusion-related errors, particularly with complex infusion therapy such as PN. Also, without communication and coordination between the primary and infusion pharmacy providers, LTC facilities could be required to work with differing and separate medication administration records (MARs) from each pharmacy provider.

**Ineffective resident monitoring.** Residents who receive infusion therapy can experience a wide range of adverse effects ranging from infiltration of the solution at the IV site to serious fluid, electrolyte, nutritional, or medication adverse effects. Ineffective resident monitoring allows potentially unsafe effects to go unnoticed and uncorrected in a timely manner and may result in harm.

See the check it out section that follows (starting on page 3) for recommendations to maximize medication safety in facilities that provide IV infusion therapy.
To improve the safety of infusion therapy, consider the following recommendations.

**Validate staff competency**
- IV infusions should only be provided by licensed pharmacy staff who have specialized knowledge and skills in sterile compounding procedures and who have been verified via clinical competency assessment by a qualified trainer.
- IV infusion therapy should only be administered and monitored by licensed staff who have specialized knowledge and technical skills that are current and have been verified via clinical competency assessment by a qualified trainer.
- Nurses administering infusions must participate in quality education programs to gain and maintain the knowledge and skills associated with IV therapy and vascular access. This education should require both theoretical and practical elements of infusion therapy management. LTC facilities may find helpful educational tools in a competency-based program in the home care setting.¹
- If the LTC facility does not have the capability to consistently administer infusion therapy, consider utilizing an outsourced contracted provider that supplies both the product and medication administration services.

**Evaluate outsourced infusion therapy services**
- Any outsourced infusion therapy services for either product or administration services need to be appropriately evaluated by the LTC facility to ensure that the provider is properly licensed, accredited, and certified.
- At a minimum, ensure that the infusion pharmacy is meeting US Pharmacopeial Convention (USP) Chapter <797> standards for sterility,² and ISMP Guidelines for the Safe Preparation of Sterile Compounds for error prevention.³
- If the infusion provider is different than the primary pharmacy provider for non-infusion medications, ask the primary provider or consultant pharmacist for assistance with the evaluation process.
- During the evaluation process include review of pertinent materials such as publicly lodged complaints, data from quality improvement, quality control reports, customer satisfaction surveys, staff competency assessments, proof of external standards adherence, and reference checks with other provider IV therapy customers. Have the nursing director, the primary infusion nurse at the facility, and the consultant pharmacist (if available) conduct an onsite visit.
- Even when properly evaluated, the LTC facility staff still need to be aware that they cannot turn over the care of the resident entirely to the outsourced provider and that they are still responsible for the care provided, including the necessary monitoring of the infusion therapy.

**Use safe infusion pumps**
- Standardize the infusion pumps in use to limit variability as much as possible. Ensure staff are educated about infusion pumps and related supplies (e.g., tubing) before they are used, with hands-on practice and return demonstrations. Education is important even when staff are not directly involved in infusion therapy to ensure that they do not inadvertently change the rate or settings on the pump in the course of normal care.
- If possible, utilize or request the use of smart pumps that have pharmacy-managed drug libraries that allow the setting of dose limits to alert staff to programming errors and under- or overdoses before they can result in harm.⁴
- Ensure that the infusion pump is returned to the pharmacy (or other provider) after EACH resident use to undergo proper cleaning and ongoing maintenance.
- Keep a “resident-ready” back-up pump stored at the facility at all times, in case of pump failure. The pump should be plugged into a power outlet while stored at the facility to ensure the battery is properly charged and resident-ready. Establish a system to routinely check the preventative maintenance.

---

*SAFETY* wires continued from page 2

Because many LTC residents have already received the PPSV23 in the past, it is important that their immunization records reflect the type of pneumococcal vaccine previously administered. ACIP has specific guidelines to follow if residents have already received the PPSV23 vaccine (www.cdc.gov/mmwr/pdf/wk/mm6337.pdf). Vaccine information should be readily available where these vaccines are stored, and staff should be alerted to the differences in the two vaccines and the administration schedule. In addition, paper and electronic immunization records may require revision to allow documentation of the two specific pneumococcal vaccines. If computerized prescribing is employed, an alert about the timing of the two vaccines should be built and functional. For more information consult the IAC website: www.ismp.org/sc?id=522.

Farxiga and Fetzima mix-ups. The US Food and Drug Administration (FDA) is aware of several reported mix-ups due to name confusion between FARXIGA (dapagliflozin) and FETZIMA (levomilnacipran). Farxiga was approved in January 2014 to lower blood glucose levels in adults with type 2 diabetes when used along with diet (and exercise). It is available in 5 mg and 10 mg tablets. Fetzima, an antidepressant, was approved in July 2013. Fetzima is available in 20, 40, 80, and 120 mg extended-release capsules.

Based on the medication errors reported to FDA, the errors can probably be attributed to the drugs being marketed within 6 months of one another. Both drug names begin with the letter F and end with A, and are of the same length and number of syllables. Individuals who enter orders may choose the wrong item from computer screens. Also, the manufacturer container labels might appear similar since both display the proprietary name of the product in red font.

ISMP added this name pair to its recently revised List of Confused Drug Names (www.ismp.org/sc?id=515). If these drugs are used in your facility, consider adding computer alerts to verify the indication for these medications, which prescribers should include with orders. As practitioners become more familiar with the two products, name confusion errors should diminish.

---

*SAFETY* wires continued from page 4

Join us in celebrating National Nursing Home Week — May 10 through May 16, 2015
date on the pump in storage to ensure it is properly maintained.

- Only use the approved set-based tubing that is specific to the infusion pump in use. Do not substitute the tubing without checking its appropriateness for the infusion pump and its safety features.
- Test and ensure all infusion pump alarms are properly functioning and are not turned off when in use. Although annoying, alarms can prevent serious harm by bringing an infusion-related issue to the attention of staff quickly. Establish a standard protocol describing what staff should do in response to an alarm.

Provide Clear Labeling

- Work with the infusion pharmacy to ensure that necessary resident and order information appears on the label in a manner that can be easily used to directly compare the information to the original order.
- Check infusion bags/bottles received from the pharmacy upon receipt for the correct resident name, drug name or other contents, dose(s), administration route, frequency of administration, rate of administration, date prepared, expiration date, and storage requirements (e.g., refrigerate, do not refrigerate). The label should be on the actual drug container (infusion bag) that will be hung, and not just the overwrap. Do not accept deliveries in which labels are wet or printed lightly, since refrigeration will only make readability worse.
- Compare the infusion label to the original order or MAR prior to administration.
- Orient staff to the infusion therapy labels in use, particularly for complex infusions such as PN, to reduce the risk of misinterpretation.
- If a resident is receiving more than one IV medication or infusion, label the line (tubing) at the point closest to the resident with the name of the drug. Prior to hanging an infusion, trace the line from the pump to the resident’s IV access site to verify the connection. It is also important to differentiate with labeling both enteral and IV lines to prevent administration by the wrong route.

Communication

- Establish a formal and regular communication process for updates on all residents on infusion therapy on specific days and times. Cooperation between physician, facility nursing staff, pharmacy provider for infusion therapy, and consultant pharmacist is essential.
- Designate a few nurses (all shifts) as infusion experts, with one serving as the primary contact, to work closely with prescribers and the infusion pharmacy.

Monitoring Residents

- Establish appropriate protocols for monitoring infusion therapy, with clearly-defined actions to be taken if the therapy is not achieving its desired outcome or if an adverse event occurs. Specific parameters should be identified based on the medication being infused and/or resident vulnerabilities (e.g., history of sleep apnea and opioid use), including vital signs and laboratory testing.
- The parameters (e.g., frequency, criteria) for monitoring and recording the assessment of the resident’s IV access site should be provided in facility procedures. Special policies and precautions need to be in place when managing certain central access devices such as peripherally inserted central catheters (PICC) lines.

References appear in the bottom of right column.

Complete our Survey!

Here is still time before the May 29 deadline to complete, our readership survey at: www.ismp.org/sc?id=528. The survey will take just a few minutes to complete, and your input is important. A copy of the survey can also be found in last month’s issue. Thank you!

> SAFETY wires continued from page 3

A point about levothyroxine. A physician ordered SYNTHROID (levothyroxine) 0.25 mg for a long-term care (LTC) resident. The LTC pharmacy confused mg and mcg (1 mg =1,000 mcg) and dispensed 25 mcg instead of 250 mcg (a large but correct dose for this resident), resulting in a 10-fold overdose.

This is not the first time we have heard about errors confusing mg and mcg with this drug. In 2003, errors had become so common with levothyroxine that one pharmacist told us he had set up his computers to signal an alert whenever a 0.25 mg dose was entered. When the warning appeared, the correct dose almost always was 0.025 mg or 25 mcg.

Prescribers need to be alerted to the risks associated with dosing this product. Pharmacists and nurses at LTC facilities need to provide feedback directly to prescribers if a dosing error, especially an overdose, is suspected. In order to avoid decimal points and dose conversions, healthcare practitioners should express the dose of levothyroxine in the same way most manufacturers express the dose—in mcg, not mg.

References

4) ISMP Proceedings from the ISMP summit on the use of smart infusion pumps: guidelines for safe implementation and use. 2009. www.ismp.org/sc?id=527