

ISMP Medication SafetyAlert!®

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SafetyBriefs



Name watch: Avandia-Prandin.

We received a report this week about a medication error that resulted when an order (see Figure 1) for PRANDIN (repaglinide) was

*Prandin 2mg PO before breakfast
and 4mg PO before dinner*

Figure 1. Is this order for Avandia or Prandin?

misread as **AVANDIA** (rosiglitazone). We first reported such mix-ups in our September 8, 1999 newsletter, so this has been a long-standing problem. Both drugs are used to treat diabetes, so matching the drug to the patient's diagnosis would not, in itself, help to prevent a mix-up. Avandia improves glycemic control by improving insulin sensitivity, while Prandin lowers blood glucose levels by stimulating the release of insulin from the pancreas. There are not many variables to help differentiate handwritten prescriptions for these drugs. Both are available in tablet dosage forms in 2 mg strengths, and individual doses of 4 mg are within the therapeutic range for each drug. Avandia is usually prescribed once or twice daily and may be taken with or without meals, while Prandin doses are usually taken within 15 minutes of the meal, but time may vary from immediately preceding the meal to as long as 30 minutes before the meal. As a precaution, encourage prescribers to include generic names when handwriting orders to help staff differentiate these look-alike brand names.



A risk that should not be

tolerated. Nurses who are directed to enter the pharmacy after hours are often subjected to a heightened risk of selecting the wrong medication. The following recent event provides one of many examples of the danger of this practice. A patient was brought to an emergency department (ED) after complaining of shortness of breath. He'd been feeling ill for several days. The patient was about to be transferred from the ED to a patient room when his condition suddenly worsened. A physician assistant ordered furosemide injection for

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Infusion free-flow apparently still a risk

First reported in the late 1980s and early 1990s by ISMP and the ECRI Institute,¹⁻³ accidental, uncontrolled free-flow of IV solutions after removal of administration sets from infusion pumps was recognized as a serious problem that led to death and patient injury. Free-flow events occurred when pump tubing was removed from the device while still connected to the patient, before closing the set's manual tubing clamp. This resulted in a large volume of solution infusing rapidly into the patient, along with drug or nutrient overdoses if the infusions contained medications or parenteral nutrition. In response to this risk, manufacturers introduced free-flow protected tubing as a fail-safe to prevent gravity flow, by automatically clamping the set immediately upon its removal from the pump. In 2001, The Joint Commission surveyors began evaluating healthcare organizations' use of infusion pumps with free-flow protection, and in 2003, it implemented a National Patient Safety Goal (NPSG) to promote free-flow protection with all general-use and patient-controlled analgesia (PCA) IV infusion pumps in the organization.

This 2003 NPSG has, in essence, assured that manufacturers are no longer distributing non-protected devices. However, despite seemingly fail-safe interventions by device manufacturers, ISMP is aware of the potential for intravenous free-flow events if administration set tubing is misloaded in infusion pumps. Although subsequently addressed by the manufacturer, the problem was well documented in a 2006 article published in *Anesthesiology*, which described a free-flow event with the Alaris Medley Medication Safety System when the set was accidentally misloaded.⁴ More recently, in April 2007, Smiths Medical also sent a SafetyAlert letter to its customers to warn about the risk of a free-flow event with certain administration sets if the tubing is improperly attached to the pump (visit www.ismp.org/resources/smithsmedical to read the Safety Alert). ECRI Institute also followed with a warning to its members about this risk. With two manufacturers reporting similar problems, we are concerned that this type of hazard may also be possible with other infusion pumps and administration sets.

The article published in *Anesthesiology* describes a free-flow event with a 58-year-old man undergoing surgery. The patient's

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WorthRepeating...

IV tubing misconnected to tracheostomy collar

While bathing a patient, a nursing staff member accidentally connected IV tubing from an insulin infusion to the port of a tracheostomy collar. (A tracheostomy collar secures the tube's positioning once the surrounding balloon is inflated to minimize movement of the tracheostomy tube. Since a parenteral syringe is typically used for inflation, the port has a Luer connector.) Normally, patients wore gowns with sleeves that snapped closed. However, on the day of the error, this patient happened to be wearing a gown without snaps. In order to remove the gown, the staff member disconnected the patient's IV insulin infusion and threaded it through the sleeve. When reconnecting the tubing, the nursing staff member connected the IV line to the Luer connection on the tracheostomy collar. Fluid began to further inflate the tracheostomy collar balloon, constricting the tube itself. The error was noticed when the patient began to decompensate and became cyanotic. The IV line was immediately disconnected from the tracheostomy collar, and approximately 30 mL of fluid was removed from the balloon. Fortunately, the patient suffered no permanent harm.

In our November 28, 2001 newsletter, we reported a similar error in which an IV solution was accidentally infused into the balloon of a tracheostomy collar, resulting in hyperinflation of

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SafetyBriefs continued from page 1 diuresis. A nurse went into a locked pharmacy after it was closed to retrieve the drug. The Joint Commission prohibits this practice, but the facility was not accredited by this agency. The nurse returned to the ED and administered the medication she had retrieved from the pharmacy. Within a minute, the patient arrested and was unable to be resuscitated. The nurse had accidentally retrieved a vial of potassium chloride concentrate injection from the pharmacy instead of furosemide. The death was initially attributed to natural causes. The mix-up was discovered several hours later when the nurse returned to the pharmacy to document the medication in a logbook. While making the entry, the nurse realized that furosemide came in a brown bottle with a yellow lid, whereas the drug she had selected was in a clear vial with a black lid. She then learned that the vial she had selected was potassium chloride, not furosemide. Although it is unclear why the error occurred, potassium-furosemide mix-ups reported in the past have often been related to mental slips in which the IV diuretic was tied to an order for a potassium level and/or potassium supplementation (Cohen M. Potassium chloride and Lasix injection - peculiar pattern of medication error deaths. *INS Newslines* 1992; 13(5):6-7).

Message in our mailbox



We received a response to our May 31, 2007, article about a medical resident who prescribed a vecuronium infusion for the wrong patient via a computerized prescriber order entry (CPOE) system in a remote location (*Remote CPOE error— a situation that's more than remotely possible*). **Tim Vanderveen**, PharmD, Vice President, Center for Safety and Clinical Excellence, Cardinal Health/Alaris, correctly pointed out that use of a smart pump might have averted such an error. If a fully functional smart pump had been used, and the correct patient care setting had been selected (medical unit), it is unlikely that vecuronium would have been in the drug library. This could have warned the nurse that there was something wrong with the order. In addition, in the event that an incorrect patient care area had been selected, a clinical advisory could have appeared (on smart pumps that allow user-defined alerts), noting that vecuronium paralyzes the respiratory muscles, and requiring the nurse to confirm that the patient is on mechanical ventilation.

Free-flow continued from page 1 arterial pressure suddenly decreased during surgery for no apparent reason, requiring treatment with vasopressors. After the patient's blood pressure was stabilized, staff realized that a nitroglycerin infusion had flowed into the patient via gravity and was empty. Upon close inspection, they noticed a gap at the top of the pump door and found that the upper flange part of the tubing had not been loaded properly. The door had closed sufficiently, but the misloaded tubing had disarmed the mechanism used to prevent free-flow. The pump database revealed that the pump had alarmed and displayed an error message during set-up. But the message reported a possible *occlusion*, thus the *free-flow* problem was not recognized and the alarm was overridden. In addition to design changes made in the pump module, the error message has since been changed in current software applications to better recognize the risk of free-flow.

While Smiths Medical has received no reports of free-flow events, the manufacturer has confirmed that, if certain administration sets (cassette reservoirs) with flow stop are incorrectly attached to its ambulatory pumps, CADD-1, CADD-Legacy, CADD-PCA, CADD-Plus, and CADD-Prizm, the flow-stop spring lever arm may not fully activate, potentially leading to unregulated gravity flow to the patient. Smiths Medical will be reintroducing the

administration sets with integral anti-siphon valves to prevent further problems.

As mentioned, free-flow events due to misloading of administration sets may not be limited to these administration sets and infusion pumps. We highly recommend that you test your pumps in a simulated clinical setting to see if similar problems exist. You may also want to contact your infusion pump vendor to see if representatives are aware of free-flow risks when administration sets are misloaded in their pumps. The authors in the above-cited article⁴ emphasized the fact that they had performed an extensive failure mode and effects analysis (FMEA) before using the infusion pumps, but the FMEA did not predict the failure mode causing the free-flow event. The authors also noted that the FMEA team was aware of reports of incorrect loading of the tubing. Because of this, the team-designed training specifically focused on the correct loading of the administration set. Again, the training did not prevent the event. Please take the time to investigate how misloaded tubing could affect the performance of your infusion pumps. If you uncover any problems, please report them to ISMP (isminfo@ismp.org). We will ensure that the reports are forwarded to FDA and the device manufacturer, and will publish confirmed problems in our newsletters.


References: 1) Cohen MR. Avoid the risk of electronic infusion control device free flow incidents. *Hosp Pharm* 1989;24:510. 2) ECRI. Infusion pumps, general purpose. *HealthDevices Alerts*. FDA data accession No. 173580. December 22, 1989. 3) Cohen MR, Davis NM. Free flow associated with electronic infusion devices: an underestimated danger. *Hosp Pharm* 1992; 27:387-90. 4) Schroeder ME, Wolman RL, Wettermecek TB. Tubing misload allows free flow events with smart intravenous infusion pump. *Anesthesiology* 2006; 105:434-5.

Special Announcements...

ISMP teleconference. Join us for our next teleconference, *The Joint Commission (TJC) Update: 2007-2008 Requirements Related to Medication Use*, to be held on **July 18**, and repeated on **August 2**. Guest speaker **Darryl Rich**, PharmD, a surveyor for TJC, will present information regarding the Medication Management (MM) standards (including MM.4.10, regarding review of orders in the emergency department) and the **2008 National Patient Safety Goals (NPSG)**. In addition, current MM standards and NPSGs that have proven difficult for hospitals during 2006 and 2007 will be discussed, along with strategies for improved compliance. For more information, please visit: www.ismp.org/educational/teleconferences.asp.

Osteoarthritis guides. The Agency for Healthcare Research and Quality (AHRQ) has published two new guides, based on 360 published studies, that summarize the benefits and risks of arthritis pain medications. The clinician's guide, *Choosing Non-Opioid Analgesics for Osteoarthritis*, evaluates the scientific evidence that applies to the drugs' benefits and risks; the consumer's guide, *Choosing Pain Medication for Osteoarthritis*, summarizes the evidence on prescription and non-prescription drugs. Both can be found at: <http://effectivehealthcare.ahrq.gov/reports/index.cfm>.

ISMP SafetyContest

 Help us celebrate **Healthcare Risk Management Week, June 18-22, 2007**, by participating in our **Patient Safety Contest**. This year, we're seeking entries responsive to the following categories:

(1) Medication safety competencies. Submit a description of how you have built, maintained, and measured medication safety competencies for medical, nursing, and pharmacy staff.

(2) Dashboard reports. Submit an example of a dashboard safety/quality report that you routinely provide to the board, organizational leadership, and/or patient safety committees. The report must include measures directly and/or indirectly related to medication safety.

(3) Medication reconciliation. Submit a description of successful strategies that have been used to provide the patient's discharge medication list to the next provider of care, including the patient's primary care physician.

(4) Web-based consumer education. Submit a description and URL for a hospital-based website that has been created to help educate patients about medications and safety.

(5) Communicating "lessons learned." Submit a description and examples of the vehicles used to communicate important safety "lessons learned" to staff.

Visit www.ismp.org/contest for **required supporting documentation** and submission guidelines. All entries must be received by **July 27**. One first place winner will receive **\$500** to be used toward a patient safety project; second and third place winners will receive **\$250** for the same purpose.

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WorthRepeating... Misconnection continued from page 1

the collar, constriction of the tube's lumen, and an airway obstruction. High-volume, low-pressure collars are used to lower the long-term risk of tracheal injury, so they are compliant enough to accept large volumes of air—or fluid, in this case. The patient's roommate alerted a nurse to the patient's respiratory distress, and a code was called. The error was noticed when the code team was unable to inflate the lungs. The line was disconnected and the fluid was removed from the collar, but the patient died.

Several factors contributed to the 2001 error. In low, overhead lighting during the night, the nurse had mistaken the tracheostomy collar port as a triple lumen catheter port, especially since the unsecured tubing hung down at the same level as the tracheostomy collar tubing. Although the size of the tracheostomy collar line is distinctly thinner than *regular IV tubing*, *triple lumen tubing* is similarly thin like the tracheostomy collar line. Furthermore, the connection ports on needleless tubing can appear very similar to the tracheostomy collar line—an interesting example of how even a powerful safety innovation—a needleless system—can lead to new, unexpected problems.

ISMP has received reports of numerous other inadvertent misconnections to balloon ports of various catheters and tubing, including:

- ▶ Accidental injection of drugs into an endotracheal tube collar during resuscitation efforts
- ▶ Drugs inadvertently delivered into the balloon inflation ports of Foley catheters and gastrostomy tubes.

These adverse events can be grouped into a larger class of errors labeled as, "Wrong tube, wrong hole, wrong connector." Ideally, inflation and infusion ports should be incompatible, and interconnectivity should be impossible through product redesign. Until this occurs, consider the following error-reduction strategies.

Identify error potential through failure mode and effects analysis on existing medical tubing and when introducing new tubes, catheters, and connectors into a healthcare system. If possible, include an assessment of near novices doing multiple connections on manikins or in other simulated environments to promote the identification of, and focus on, high-hazard conditions. When possible, do not purchase tubing and connectors for non-intravenous functions that are compatible with IV tubing connectors.

Provide training to nurses, pharmacists, physicians, and respiratory therapists before using new tubes, catheters, and connectors. Include discussion about possible sources of errors identified during failure mode and effects analysis and steps to avoid these errors. When possible, include tubing misconnections in simulation training during orientation and annual safety competencies.

Affix labels on lines near insertion sites if the patient has more than one potential connection to a port of entry into the body (e.g., IV, arterial, umbilical, enteral, bladder, tracheostomy, drainage tubes).

Promote a consistent process for tracing all lines from the source (and infusion pump if used) to the connection port to verify attachments before connecting or reconnecting tubing, and/or administering drugs, solutions, or other products. Remind staff that, for patients with multiple tubes, situational awareness of each tube's location and insertion site can be lost, especially if tubing is obscured by bedclothes and sheets.

Staff who are allowed to connect, disconnect, or reconnect medical tubing should be limited to those with professional healthcare training who are more likely to know and follow safety measures (such as tracing the line from the source to the point of entry), and are knowledgeable about the serious ramifications of misconnections. During orientation, include prohibitions to connecting/disconnecting medical tubing so those who should not be involved in these activities are aware of the mandate and reasons that require it.

Improve the environmental conditions under which medications are administered. Not surprisingly, we have often received reports of errors that have taken place at the bedside under poor lighting, particularly at night. Practitioners should adjust lights as needed for critical tasks (using flashlights, if necessary).

Monitor patients appropriately (e.g., vital signs, frequent observation, pulse oximetry, capnography, cardiac monitoring) to detect an error quickly, and minimize the consequences of an error.