

ISMP Medication SafetyAlert!®

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SafetyBriefs

Today and Qday. We heard from a hospital pharmacist about an error-prone condition that resulted from banning use of the abbreviation "QD" for daily. Since prescribers can no longer use "QD," they are now using a different abbreviation for daily, "Qday." This may initially appear to be a satisfactory compromise, however, "Qday" has now been misread as "Today," and "Today" has been misread as "Qday." These two terms also sound alike and could be misheard as one another. The latest errors involved written orders for "Coumadin today" that were misinterpreted as "Coumadin Qday" (see example). After receiving *daily* doses

of warfarin, several patients developed elevated INRs. Unfortunately, prescribers who were notified of the elevated INRs did not know the patients were receiving daily doses of the drug; thus, they did not know that an order for "no warfarin today" was indicated. The errors were finally recognized and more serious outcomes were avoided. Please remind all staff that the only safe way to communicate "daily" is to print it out fully. Another point: Physicians who routinely review the patient's medication administration record are more likely to recognize transcription errors like these and correct them in a timely fashion, thereby reducing the risk of harm.



When does Q look like 2? The physician who wrote the RITALIN (methylphenidate) order below intended for the patient to receive 5 mg "now" and then 5 mg every morning. However, he used a cursive upper-case letter Q, which nurses misread as the number 2. Adding to the confusion, nurses who were discussing the order felt it could be inter-

continued on page 2 ▶

Preventing accidental IV infusion of breast milk in neonates

This week we heard from the mother of a hospitalized infant named Zoey who accidentally received breast milk intravenously (IV) instead of through a nasogastric (NG) tube. The baby was born with duodenal atresia—complete absence of the duodenal lumen—so surgery was necessary at birth. The procedure was successful, after which a NG tube was inserted in order to provide nutrition with regular feedings of 30 mL of fortified breast milk administered over 2 hours. At the time of the event, an IV syringe pump for medications was located on the left side of the baby's incubator and an identical pump used to deliver breast milk via the NG tube was on the right. The pumps used identical IV administration tubing. Although it's not clear how the tubing used for breast milk was connected to the NG tube, a nurse mistakenly connected a syringe containing breast milk to the wrong line. About 10 mL of milk was infused IV before the problem was recognized. The baby developed respiratory distress and also had seizures. She was treated supportively and, fortunately, she recovered and does not seem to have any lasting adverse effects. However, infusion of non-sterile, particulate fluid such as enteral feedings or breast milk can be fatal, as it carries the risk of sepsis, diffuse intravas-

cular coagulation (DIC), or emboli to major organs, which can lead to organ damage and pulmonary embolism.

Review of the literature reveals cases of inadvertent IV administration of breast milk reported as early as 1972.¹ As this case demonstrates, inadvertent IV administration of breast milk is still happening today despite recognition of the problem more than 3 decades ago. Ryan et al² recently reported a similar case and noted that neonatal health professionals communicated eight previously unknown events to the authors after they posted a question about accidental milk infusion to an online, e-mail discussion group.

All hospital staff—particularly in neonatal units—need to take the risk of misconnections seriously and proactively eliminate all chances of IV infusion or direct injection of non-sterile, particulate fluids meant for enteral administration. An April 2006 Joint Commission *Sentinel Event Alert* on tubing misconnections (www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_36.htm) provided a number of excellent recommendations for preventing such tragedies, including: 1) tracing the tubing to the point of origin before making any connections or reconnections, 2) rechecking connections and tracing all patient tubes and catheters to their sources upon

continued on page 2 ▶

WorthRepeating...

Complacency with using magnesium sulfate could lead to tragedy

Last week we learned about another tragic death of a young woman in labor caused by an overdose of magnesium sulfate, used to treat preterm labor and preeclampsia. A 2004 article by Simpson and Knox¹ spurred our prior mention of tragic errors like this one in our newsletter (October 20, 2005). In that issue, we described five overdoses of magnesium sulfate in which one patient died and two patients suffered anoxic encephalopathy, leaving them in vegetative states. In the latest error, an 18-year-old woman mistakenly received 16 g instead of 4 g of magnesium sulfate. Sadly, the patient's husband tried to tell nurses that something was wrong when his wife first developed signs of toxicity, but the error was not detected until it was too late to save her. Fortunately, the patient's son was delivered by emergency cesarean section and, although 2 months premature, he is thriving.

Although news reports do not suggest how the error happened, the most common causes of magnesium sulfate overdoses include unfamiliarity with safe dosage ranges and signs of toxicity, inadequate patient monitoring, pump

continued on page 3 ▶

SafetyBriefs continued

preted several different ways: Give a 5 mg dose now and again at 2 am; Give a 5 mg dose now and then every day at 2 am; or Give a 5 mg dose now and then two 5 mg tablets each morning. Because of the different potential interpretations of the order, one of the nurses called the physician for clarification. She then learned that they had all misread the Q as the number 2. While "q" for "every" is not included in the ISMP List of Error-Prone Abbreviations (www.ismp.org/Tools/abbreviationslist.pdf), we have written about other occasional misinterpretations of this abbreviation. For example, in our February 6, 2003 newsletter, we noted that the abbreviation "q" in an order for **LEVOXYL** (levothyroxine) "1 tab po q day" had been misread as the number 5, leading the pharmacist to dispense the drug with directions to take "1 tab 5 days each week." These errors offer insight into why most abbreviations are error-prone, as well as evidence of the need for high-leverage error-reduction strategies such as computerized prescriber order entry systems, which can reduce the risk of misinterpreting handwritten orders.

Message in our mailbox

Lab results. Frank Federico, from the Institute for Healthcare Improvement, wrote in support of our March 23, 2006 article, "Valuable report

on reporting values," in which we noted that delays or breakdowns in communicating critical test results can result in patient harm. He noted that the Massachusetts Coalition for the Prevention of Medical Errors (Coalition), the Massachusetts Hospital Association (MHA), and Massachusetts hospitals have worked together on a patient safety initiative to promote timely and reliable communication of critical test results to the clinician who can take action. The following are among the Coalition recommendations:

- 1) Keep the focus on getting results to the clinician who is responsible for taking clinical action based on the test results;
- 2) When possible, directly contact the physician;
- 3) In outpatient settings, if lab results are communicated to a registered nurse, clarify how the results will be subsequently communicated to the physician; and
- 4) Call results for inpatients to both the registered nurse and the responsible provider.

These guidelines are intended to increase the reliability of lab notification. For more information, please visit: www.macoalition.org/initiatives.shtml.

Breast milk IV continued

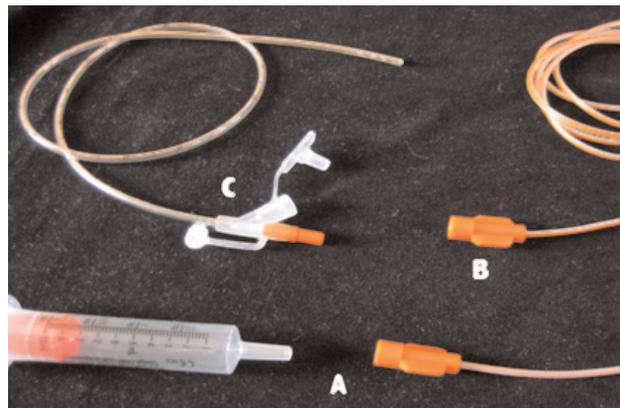
transfer to a new setting, and 3) labeling tubes and administration sets. However, as emphasized in many of our prior newsletters as well as in the April *Sentinel Event Alert*, the best chance of eliminating the risk of injecting enteral solutions intravenously is to use an oral syringe which is incompatible with IV tubing.

Enteral pumps for adults cannot deliver feedings in the small amounts necessary for premature infants.³ Thus, as in the aforementioned event, staff in neonatal and pediatric intensive care units sometimes employ off-label use of parenteral syringe pumps to administer breast milk enterally, although infusion rates may vary slightly from the programmed rate.^{3,4} (Some pump manufacturers are in the process of adjusting IV syringe pumps to accommodate oral syringes.) In these cases, syringes with standard Luer connections should be avoided and NG tubes should connect only to oral syringes via syringe extension sets. Viasys Healthcare (www.viasyshealthcare.com) and Neo Devices (www.neo-devices.com) offer such systems, with non-Luer feeding tubes and extension sets. For example, the **CORFLO** Enteral Feeding System from Viasys has an administration set, for use with a syringe pump, that can *only* be connected to a syringe tip on an oral syringe (see photo). Unlike typical IV sets with a male Luer at the distal end, the connector at the distal end of the set is female and will *only* connect to a proprietary male connector on the system's feeding tube, thus preventing possible connection with an IV line. There are no IV ports on the NG tube or the

administration set. The feeding tube has a side port that only allows connection of an oral syringe. Both the administration set and feeding tube also have an orange stripe along their lengths to distinguish them from IV lines. Unless makeshift fittings are created, feedings and oral medications cannot be administered via an IV line when using this tubing and an oral syringe. Children's Medical Ventures (<http://enteral-extensionsets.respironics.com/>) also offers non-Luer extension sets for enteral feedings, but the company does not provide feeding tubes.

Although IV administration of breast milk may not happen often, the risk of patient harm is high when it occurs. Its remedy is within reach of all providers: use an anti-IV NG tube and administration set, and an oral syringe. We also recommend labeling the pumps as "Medication" or "Breast Milk" as well as labeling the breast milk syringes. If your organization hasn't addressed this issue, put it on your safety agenda now! Zoey's mom wanted us to advocate for immediate action before another child is injured from this potentially fatal but preventable error.

References: 1) Wallace JR, Payne RW, Mack AJ. Inadvertent IV infusion of milk. *Lancet* 1972;1:264-6. 2) Ryan CA, Mohammed I, Murphy B. Normal neurological and developmental outcome after an accidental IV infusion of expressed breast milk in a neonate. *Pediatrics* 2006;117(1):236-8. 3) Page L. Diligence, technology prevent IV and feeding tube mix-ups: finding the wrong fit. *Materials Management in Health Care* April 2006;24-28. 4) Copeland D, Appel J. Implementation of an enteral nutrition and medication administration system utilizing oral syringes in the NICU. *Neonatal Network* January/February 2006;25(1):21-24.



Viasys Corflo Anti-IV System. Syringe pump's oral syringe connects with a non-Luer female connector of administration set extension tubing (A). Distal end (B), also a non-Luer female connector, fits the anti-IV NG tube (C) with a male non-Luer connector. Note the orange stripe length of extension tubing and NG tube, and the non-Luer side port on NG tube for medication administration from an oral syringe.

Special Announcements...**June/August teleconferences.**

There is still time to register for our **June 29** teleconference, *The Impact of Clinical Decision Support Systems: Alerts and Standardized Order Sets*. Guest speakers **Eric Pifer, MD**, Chief Medical Informatics Officer at the University of Pennsylvania, and **Peter Kilbridge, MD**, Associate Chief Information Officer for Patient Safety and Clinical Effectiveness at Duke University, will discuss safety alerts used to augment decision-making when prescribing drugs. On **August 3**, ISMP will present another teleconference, *2006-2007 JCAHO Update: Requirements Related to Medication Use*. Our guest speaker, **Darryl Rich, PharmD, MBA**, Joint Commission surveyor, will discuss the revised hospital Medication Management standards and other new standards related to medication use (effective June 2006). Dr. Rich will also share information about the standards and NPSGs that have proven most challenging in the past year, as well as offering tips to help prepare for unannounced surveys. This program will be **repeated on August 10, 2006**. For information on the June and August teleconferences, visit: www.ismp.org/educational/teleconferences.asp.

Label guidelines. Thanks to all who provided comments on our draft label guidelines for inpatient oral liquid medications. Revisions have been made and the final version can be found at: www.ismp.org/Tools/Draftguidelines, along with the final guidelines for oral solid labels. We have now posted draft label guidelines for inpatient small volume parenterals (syringe labels) at the same website, which are available for comments until June 30, 2006.

New ISMP staff. **Donna Horn, RPh**, has joined our staff as Director, Patient Safety-Community Pharmacy, to direct ISMP's patient safety activities in community/ambulatory practice. She has more than 25 years of experience in community pharmacy, most recently serving as the Privacy Officer and Manager of Regulatory Affairs for Brooks/Eckerd Pharmacy. Prior to joining ISMP, Ms. Horn served as President and Chairperson of the National Association of Boards of Pharmacy where her focus was primarily on reducing medication errors in community pharmacy. She also served eleven years on the Massachusetts Board of Registration in Pharmacy as both a member and as President.

WorthRepeating...magnesium sulfate continued from page 1

programming errors, unlabeled bags of magnesium sulfate, and mix-ups between magnesium sulfate and oxytocin. In this case, the nurse involved in the error is described as an "outstanding team member"² and a 20-year veteran of labor and delivery, a sobering reminder that even the most experienced and vigilant practitioners can make errors.

Just 2 days before publication of this newsletter we learned of yet another magnesium sulfate overdose that occurred in the emergency department (ED). The physician had prescribed an unusually dilute loading dose of 4 g/500 mL to infuse over 30 minutes, to be followed by a maintenance infusion at 2 g/hour. The pharmacy had mixed the 4 g loading dose and sent it to the ED. An obstetrical resident arrived to evaluate the patient and subsequently sent a technician to the labor and delivery unit to obtain a premixed bag of magnesium sulfate 20 g/500 mL for the maintenance infusion, as none were available in the ED. The technician left the maintenance infusion in the ED medication room where the nurse picked it up, believing it was the loading dose. She had seen the highlighted concentration of 40 mg/mL on the 20 g/500 mL bag and mistakenly thought she had picked up the bag that contained 4 g. She ran the 20 g/500 mL infusion at 999 mL/hour, expecting the intended 4 g loading dose to infuse in 30 minutes. Shortly thereafter, the patient complained of dizziness and blurred vision. The infusion was stopped and the ED physician evaluated the patient. He restarted the infusion at 500 mL/hour, and then decreased it to 250 mL/hour when the patient continued to complain of visual disturbances and dizziness. The error was finally discovered a short time later when the patient was transferred to the obstetrical unit. Fortunately, the baby was delivered by caesarian section and both the patient and her infant sustained no additional harm.

Don't be misled by a solid safety record in your hospital's labor and delivery unit. Complacency with using this drug could eventually lead to a tragedy. All hospitals that offer obstetrical services (in the ED and obstetrical units) should not delay in implementing these error-reduction strategies, which are **WorthRepeating**:

- Establish dosing and administration protocols and standard order sets.
- Standardize the unit of measure used to prescribe magnesium sulfate and to report magnesium lab values.
- Use commercially available premixed piggybacks for bolus doses (e.g., 4 g/100 mL) and premixed maintenance solutions. (A concentration of 20 g/500 mL is preferred to reduce the risk of harm in the event of an infusion rate error.) Do not infuse the bolus dose from the maintenance solution.
- Provide readily accessible drug references listing maximum doses, signs of toxicity, and monitoring parameters.
- Always require administration via an infusion pump, preferably a smart pump with operational dose range alerts.
- Trace the tubing by hand from the IV bag, to the pump, and then to the patient for verification before starting infusions or giving bolus doses.
- Require an independent double check before administering the drug and upon transferring the patient.
- Label the IV tubing near the IV pump.
- Frequently monitor the patient's vital signs, oxygen saturation, deep tendon reflexes, and level of consciousness (and fetal heart rates/maternal uterine activity if the drug is used for preterm labor).
- When giving a bolus, remain at the bedside to monitor the patient continuously.
- Assess the patient for signs of toxicity (e.g., visual changes, somnolence, flushing, muscle paralysis, loss of patellar reflexes) or pulmonary edema. If present, immediately investigate the possibility of an error.
- Ensure that staffing patterns allow time for proper monitoring on antepartum and postpartum units.
- Stock calcium gluconate nearby with directions for use during respiratory depression.
- If the drug is discontinued, immediately remove and discard the bag and tubing.

Please see our October 20, 2005 article (www.ismp.org/Newsletters/acutecare/articles/20051020.asp) for details.

Reference: Simpson KR, Knox GE. Obstetrical accidents involving intravenous magnesium sulfate. *Am J Maternal Child Nurs* 2004;29:161-71.

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