

Nurse AdviseERR®

Educating the Healthcare Community About Safe Medication Practices

Part 2: Results of pediatric medication safety survey Comparing data subsets points out areas for improvement

Preventing medication errors in pediatric patients poses unique challenges for healthcare providers. Pediatric patients are three times more likely than adults to experience a harmful medication error¹ or adverse drug reaction² given their size, immature renal and hepatic functions, inability to communicate the symptoms of adverse effects, and other risk factors. Children are particularly vulnerable to errors if they are younger than 2 years old, in the neonatal intensive care unit or emergency department, receiving chemotherapy or other IV medications, or if their weight has not been documented.³

In March and April 2015, ISMP conducted a survey to learn about the frequency with which healthcare providers employ key error-prevention strategies and “best practices” when caring for pediatric patients. We received responses from 1,463 clinicians, mostly nurses, pharmacists, and physicians, working in both inpatient and outpatient settings.

In our July 2015 newsletter, we presented the aggregate survey results as **Part 1** of our analysis. We also compared the findings to a similar survey we conducted 15 years ago. In **Part 2**, we compare subsets of the survey data based on the participants’ practice site and professional designation (results in **Table 1**, page 3). Although the results confirm some logical assumptions about the implementation of medication safety best practices in pediatrics, there are areas of exception worth noting.

Practice Site Comparisons

General practices. The majority of survey participants are weighing patients only in metric units and documenting weights using only the metric system. Most participants in pediatric hospitals (87%) and adult-pediatric hospitals (76%) said they always express doses of liquid medications in the metric system, but only 67% of outpatient facilities reported the same. The lowest scoring general strategies included standardizing and limiting the concentrations and dosage strengths of high-alert medications, particularly in outpatient facilities (60%), and separating adult and pediatric medications in storage areas, particularly in adult-pediatric hospitals (49%).

Prescribing practices. Best practices associated with prescribing pediatric medications were reported in higher frequency in both inpatient and outpatient facilities that treat *only* pediatric patients. Adult-pediatric hospitals tended to report lower compliance with safe prescribing practices. However, approximately one-third or more of all participants did not report full compliance for any prescribing best practices, suggesting the need for improvement.

For example, prescribers consistently include both the basis for the dose (e.g., mg per kg) and the calculated amount per dose in medication orders or prescriptions in just 40% of pediatric hospitals, 41% of outpatient facilities, and 33% of adult-pediatric hospitals. Prescribers consistently order pediatric liquid medication doses in metric doses, not volume alone, in only about half of all participant facilities. The patient’s weight in kg or g is entered into the computerized prescriber order entry (CPOE)

continued on page 2—**Pediatric survey** >

SAFETY wires

Demonstration pack mistaken as starter pack. While planning the discharge of a patient who had a pulmonary embolism, pharmacy was notified that the patient had been given a 30-day sample starter pack of XARELTO (rivaroxaban). The hospital did not permit samples to be dispensed and had previously given out Xarelto discount vouchers provided by the manufacturer. So, the pharmacist went to the patient care area to follow up and find out how the patient received a Xarelto sample packet instead of the voucher that was usually given to patients at discharge.

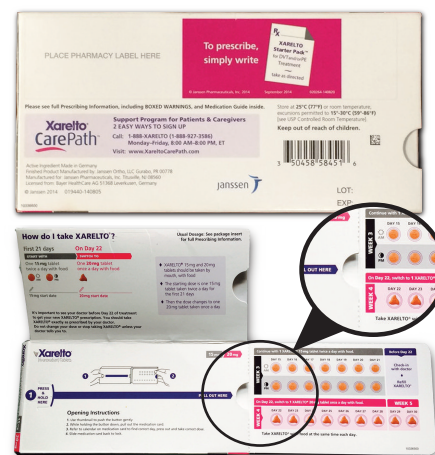


Figure 1. When what was thought to be a sample starter pack of Xarelto was opened, it contained pictures of the tablets, no actual medication.

When the starter pack that had been given to the patient was examined, it was discovered that it was not a sample starter pack at all. It was a demonstration pack designed to look exactly like the real starter pack, but when it was opened, the pack had pictures of each tablet, not actual Xarelto tablets (**Figure 1**). Fortunately, the patient didn’t wait until she got home to look at the package and how to take her first dose of medicine from the “sample package.”

continued on page 2—**SAFETY wires** >

> **Pediatric survey**—continued from page 1

system *before* medication orders are entered in 61% of pediatric hospitals, 63% of outpatient facilities, and 54% of adult-pediatric hospitals. The use of dose range checking software was reported by 65% of pediatric hospitals, 64% of outpatient facilities, and 55% of adult-pediatric hospitals. Among practice sites where parenteral nutrition (PN) or other complex electrolyte solutions were prescribed, only about two-thirds reported that prescribers order the total amount of each ingredient as dose/kg/day (e.g., mg/kg/day, mcg/kg/day) for younger children, and only about half reported ordering the total amount of each ingredient per day for older children.

Dispensing practices. Overall, pediatric hospitals reported higher frequencies of implementing best practices associated with dispensing medications than adult-pediatric hospitals or outpatient pediatric facilities.

Automated compounding devices are used to prepare solutions much more often in pediatric hospitals (84%) and adult-pediatric hospitals (71%), compared to outpatient facilities (46%). Pediatric hospitals also reported higher compliance with dispensing oral liquid doses in cups or oral syringes, and more consistent implementation of entering PN or other complex electrolyte solutions into the pharmacy computer and compounding software exactly as each ingredient is prescribed. Outpatient facilities scored as high as or higher than pediatric hospitals and adult-pediatric hospitals with requiring entry or verification of the patient's age before medication orders are entered in the pharmacy computer.

Of particular concern is that only 41% of pediatric hospitals, 43% of adult-pediatric hospitals, and 19% of outpatient facilities require the components of pediatric/neonatal compounded sterile preparations to be verified by a pharmacist prior to adding them to a solution. The lowest scoring practices for all sites were associated with the pharmacist's time spent on patient care units; for example, a clinical pharmacist is consistently available in patient care areas in just 16% of adult-pediatric hospitals, 24% of outpatient facilities, and 30% of pediatric hospitals.

Administration practices. Participants from pediatric hospitals reported a higher frequency (78%) of requiring nurses to undergo specialized training and to demonstrate clinical competency than adult-pediatric hospitals (58%) and outpatient pediatric facilities (65%). Pediatric hospitals also reported higher compliance with making available specially designed oral syringes to administer oral/enteral liquid medications. Both pediatric hospitals and outpatient facilities reported higher compliance with providing information about patient-specific doses of emergency drugs and commonly used medications on each pediatric patient's chart.

Although smart pumps with an active drug library were consistently used to administer pediatric solutions containing high-alert medications in 59% to 63% of all work places, outpatient facilities were more likely to require an independent double-check of high-alert medication solutions to verify the patient, drug, strength/dose, line attachment, and smart pump settings, than adult-pediatric hospitals or pediatric hospitals. Bedside barcode medication administration was fully implemented for medications and breast milk feedings in 58% and 48%, respectively, of pediatric hospitals, in 69% and 47% of adult-pediatric hospitals, and 43% and 13% of outpatient facilities.

Practitioner Type Comparisons

Prescribing practices. Physicians and nurses tended to report higher (and similar) rates of full compliance with prescribing best practices, while pharmacists—who see all prescribed orders daily—tended to report lower compliance. For example, physicians and nurses reported 41% and 45% compliance, respectively, with prescribers including the mg/m² or mg/kg dose and the final calculated dose with pediatric drug orders, but pharmacists reported just 26% compliance with the practice.

text continued on page 4—**Pediatric survey** >


> **SAFETY wires** continued from page 1

This demonstration “starter pack” is supposed to be used to teach patients with deep vein thrombosis or pulmonary embolism how to start the medication by taking 15 mg tablets twice a day the first 21 days, and then transitioning to 20 mg tablets once daily starting on day 22. Looking at the package, no one, including the physician, nurse, pharmacist, and patient, would have guessed that the package was a demonstration product. It lists the drug's national drug code, states it is the first 30-day supply, and upon opening, it states to find the correct day and press out and take the correct dose. The pack also has a tamper-proof locking mechanism where you would expect to find the drugs, and on the back of the package it has a place for a pharmacy label. There was, however, no lot number or expiration date, although “lot” and “exp” were printed on the packaging.

Once the pack was identified as a demonstration pack, the patient became extremely anxious as she could not afford this new medication. Pharmacy resolved the situation, but if the patient had left the hospital with the demonstration pack, she may have never filled her prescription for the Xarelto or may have eaten the cardboard tablets, believing the medicine was imbedded in the cardboard (stranger things have happened).

We contacted Janssen, the manufacturer, about the problem. Manufacturers should not be able to produce and hand out items without clearly identifying that it is for demonstration purposes only and contains no medication.

Just last December and January, the US Food and Drug Administration (FDA) (www.ismp.org/sc?id=616) and the Centers for Disease Control and Prevention (CDC) (www.ismp.org/sc?id=617) alerted the public to simulation IV solutions that were inadvertently administered to patients due to their similar appearance to real products, resulting in hospitalizations, patient harm, and several deaths.

 **OxyCODONE IV?** A patient who had a tonsillectomy was prescribed oxyCODONE hydrochloride to treat pain. However, he was unable to swallow the tablets, so his nurse

continued on page 4—**SAFETY wires** >

> Pediatric survey

Table 1. Survey Results by Practice Site and Practitioner Type (N = 1,463)

Pediatric Medication Error-Prevention Strategies	Practice Site (%)			Practitioner Type (%)		
	Full Implementation >99%					
	Pediatric Hospital	Adult-Pediatric Hospital	Outpatient Facility	Physician	Pharmacist	Nurse
General Best Practices						
Pediatric patients are weighed using metric units of measure (kg, g).	87	73	80	63	75	85
Metric units of measure (kg, g) are standard nomenclature for pediatric weights documented on medical records and prescriptions.	94	82	87	82	86	89
The volume of liquid pediatric medication doses is expressed in the metric system (e.g., mL, not tsp).	87	76	67	89	81	79
Concentrations/strengths of high-alert drugs are standardized and limited.	66	63	60	66	61	61
Adult, pediatric, and neonatal medications are not stored near one another.	57	49	69	70	47	58
Best Practices When Prescribing Medications						
Prescribers include both the mg/kg or mg/m ² dose (or other basis for the dose) <u>and</u> the calculated amount per dose for pediatric drug orders.	40	33	41	41	26	45
Prescribers order pediatric liquid medications in metric doses, not volume only.	55	47	49	49	44	56
Prescribers order each ingredient of PN/complex electrolyte solutions as dose/kg/day (e.g., mg/kg/day, mcg/kg/day) for younger children.	62	65	63	76	53	76
Prescribers order the total amount of each ingredient of PN/complex electrolyte solutions per day for older children.	51	55	50	47	42	65
Patient's weight in kg or g is entered in the computerized prescriber order entry (CPOE) system before orders are entered.	61	54	63	68	43	73
Dose range checking software is available and enabled in the CPOE system.	65	55	64	77	50	73
Best Practices When Dispensing Medications						
Pharmacists verify the mg/kg or mg/m ² dose used (or other basis for the dose) to calculate the final dose of a drug before preparing/dispensing medications.	66	61	71	50	59	46
Pharmacists recalculate the dose before preparing/dispensing medications.	63	60	67	64	54	32
The pediatric patient's weight in kg or g is entered/verified in the pharmacy computer before entering/verifying medication orders.	71	60	66	54	59	49
The pediatric patient's age is entered/verified in the pharmacy computer before entering/verifying medication orders.	46	55	59	50	41	56
Dose range checking software is available and enabled in the pharmacy computer.	60	53	62	64	50	65
PN/complex electrolyte solutions are entered into the pharmacy computer exactly as each ingredient is prescribed (no unit conversions).	72	64	55	67	64	76
PN/complex electrolyte solutions are entered into compounding software exactly as each ingredient is prescribed (no unit conversions).	78	65	63	67	69	82
Automated compounding devices are used to prepare PN/complex electrolyte solutions (or solutions are outsourced).	84	71	46	75	80	79
Preparation of IV/oral liquid doses includes barcode verification of ingredients.	42	39	46	67	29	47
The pharmacy dispenses patient-specific doses of liquid oral/enteral medications in cups or specially designed oral/enteral syringes.	78	66	64	57	74	15
Pharmacists verify components of pediatric/neonatal sterile preparations <u>prior</u> to adding them to the solution (syringe pull-back method afterwards is <u>not</u> acceptable).	41	43	19	57	28	71
Pharmacists/technicians who prepare pediatric parenteral solutions have undergone specialized training and have demonstrated competency.	53	40	35	75	37	75
Pharmacists who prepare or check pediatric parenteral solutions spend time in the neonatal/pediatric units to observe prescribing and administration.	24	16	22	36	11	67
A clinical pharmacist is present on patient care units to participate in rounds and provide input when prescribing/administering medications.	30	16	24	20	23	30
Best Practices When Administering Medications						
A smart infusion pump with an activated drug library is used to administer pediatric parenteral solutions that contain (or are) high-alert medications.	63	61	59	48	59	3
Nurses who administer medications to pediatric patients have undergone specialized training and have demonstrated competency.	78	58	65	67	59	3
Before administering high-alert parenteral drugs, a second nurse independently verifies the patient, drug, dose, line attachment, pump settings, and infusion rate.	65	63	80	48	61	4
Before administration of pediatric infusions, nurses trace the line from the medication/solution to the patient (or vice versa) to verify attachment.	52	57	54	53	50	5
Oral syringes that do not connect to IV tubing are available in patient care units.	87	77	70	68	83	3
Doses for emergency drugs and common medications have been calculated for each pediatric patient and are available for reference.	77	66	76	63	63	5
Bedside barcode scanning is used to verify patients and medications/solutions before administration.	58	69	43	50	57	2
Bedside barcode scanning is used to verify patients and breast milk before each feeding.	48	47	13	38	45	20

> **Pediatric survey**—continued from page 2

More than two-thirds of physicians and nurses reported that the pediatric patient's weight must be entered or verified in the CPOE system before medications can be entered, but only 43% of pharmacists agreed. Seventy-six percent of physicians and nurses reported full implementation of prescribing each ingredient of PN and other complex electrolyte solutions as dose/kg/day for younger children, while only 53% of pharmacists agreed.

Dispensing practices. More pharmacists reported full compliance than nurses or physicians for several dispensing practices, which may be due to professions outside of pharmacy not being aware of exactly what the pharmacist does. But one practice stands out: 74% of pharmacists reported full compliance with dispensing patient-specific doses of liquid oral/enteral medications for pediatric patients in cups or oral syringes; only 15% of nurses reported that the pharmacy dispenses these medications in cups or oral syringes.

Pharmacists did report less compliance than the other two professions for some specific tasks, suggesting the possibility that nurses and physicians may rely on pharmacy to complete these tasks without realizing they are not being carried out. Examples include:

- Available and enabled dose range checking software in the pharmacy computer
- Barcode scanning to verify the ingredients of pediatric IV and oral liquid doses during preparation
- Verification of components and amounts of pediatric and neonatal compounded sterile preparations *prior* to adding them to a solution
- Providing specialized training and requiring demonstrated clinical competency before pharmacists/technicians can prepare or check pediatric parenteral solutions

Administration practices. Nurses were much more reluctant than physicians or pharmacists to report full compliance for most of the best practices associated with drug administration, although they frequently indicated full compliance for prescribing and dispensing best practices. Even if we combine full compliance with partial compliance frequencies for comparison, nurses still reported lower compliance than pharmacists or physicians for many administration best practices. The most significant differences included:

- Use of a smart pump with an enabled library to administer pediatric IV parenteral solutions
- Conducting an independent double-check of a solution against the medication administration record or order to verify the patient, drug, strength/dose, line attachment, and pump settings
- Providing specialized training and requiring demonstration of competency for nurses who administer medications to pediatric patients
- Availability of oral syringes in patient care units to administer all liquid oral/enteral medications
- Barcode scanning at the bedside for patient identification and medication verification
- Barcode scanning for patient identification and verification of breast milk prior to feeding

Patient Care Unit Comparisons

Pediatric inpatient units. When comparing implementation of medication safety best practices among different patient care units, we found that pediatric inpatient units in a pediatric hospital scored higher than pediatric units in a general hospital. There was one exception: entry or verification of the patient's age before entering or verifying orders in the pharmacy, for which 60% of pediatric units in general hospitals reported full implementation compared to 47% of pediatric units in pediatric hospitals.

continued on page 5—**Pediatric survey** >

> **SAFETY wires** continued from page 2

asked the surgeon to switch the medication to a "liquid" form. The surgeon prescribed "liquid" oxyCODONE hydrochloride oral solution, but the nurse misunderstood and thought the "liquid" form was intended for IV administration. When the patient requested pain medication, the nurse opened a VistaPharm dose cup containing 5 mg/5 mL of oxyCODONE hydrochloride, and using a 10 mL parenteral syringe, withdrew the 5 mg (5 mL) dose. The patient was in a room that did not have a computer at the bedside (other rooms had computers). Thus, the nurse did not double check the route of administration on the electronic medication administration record (eMAR) before administering the medication by slow IV push through a sideport of a running IV of Lactated Ringer's solution. The patient did not experience distress during administration. Upon charting the medication outside of the patient's room, the nurse realized the medication was ordered orally. She immediately assessed the patient and reported the error to the patient's surgeon. The patient was monitored for the next few hours but showed no signs of distress or local reaction at the site of administration. Vital signs and laboratory studies were normal, and the patient was discharged the next day.

Several unsafe practices that led to this error are concerning. First, the nurse never verified the pharmacy's transcription of the order into the eMAR before she administered the first dose of oxyCODONE. Had she done so, she may have noticed that the drug was intended to be administered orally. Next, the computer was not available in the patient's room, so she was unable to verify the medication against the eMAR immediately prior to administration. Not only is this an unsafe practice, but the lack of a computer in the room or a portable computer is an example of a latent error that sits quietly in the system until it leads to an error. There were a few knowledge deficits evident, too. The nurse failed to recognize that a dose cup typically holds an oral medication, and that oxyCODONE is an oral drug, not a sterile IV medication.

Finally, the event draws attention to a global issue in that, despite the efforts by the International Organization for Standardization

continued on page 5—**SAFETY wires** >

> **Pediatric survey**—continued from page 4

Emergency departments (EDs). When comparing practices in EDs, we found that the best practices were reported most frequently in pediatric hospital EDs than in EDs in general hospitals. But again, there was one exception: availability and activation of dose checking software in the CPOE system—there was 53% full implementation in EDs in general hospitals, compared to 41% in EDs in pediatric hospitals.

Oncology units. Participants who worked in pediatric outpatient oncology units reported a higher frequency of implemented practices associated with prescribing and drug administration. But implementation of dispensing best practices was reported more frequently in inpatient oncology units, especially practices associated with preparing PN and other complex electrolyte solutions or sterile compounds, preparing doses of liquid oral/enteral medications in oral syringes or dose cups, and use of barcoding to verify the ingredients.

Neonatal nurseries. When comparing the different units providing neonatal care, those working in level II nurseries reported a higher frequency of implementing best practices in most areas except the presence of a clinical pharmacist; 30% of participants who worked in level III or IV nurseries reported a consistent clinical pharmacist on the unit, compared to 21% in level II nurseries.

Conclusions

Overall, ISMP's pediatric medication safety survey shows that improvements are still needed to protect pediatric patients from harmful medication errors, and all facilities and units that treat pediatric patients have something to learn from each other.

As expected, pediatric hospitals rank higher in implementing many best practices associated with medication use than hospitals that treat both adult and pediatric patients and outpatient pediatric facilities. But the survey reveals some notable exceptions. It also uncovers areas of variation between practitioners and patient care units, including the fact that physicians, nurses, and pharmacists report different levels of compliance with best practices, which offers insight into how each discipline views their own and others' contributions to pediatric medication safety.

ISMP hopes that all healthcare providers who care for pediatric patients will assess their practices, using **Table 1** (on page 3) as a guide, and develop a plan to improve implementation. Although partial adoption of the surveyed best practices is safer than none at all, any variance in practice can lead to an error—particularly if staff expect a strategy to be in place when it is not. Providers should examine their exceptions and settle for nothing less than full compliance in order to better protect children receiving medical care in any setting.

References

- 1) Kaushal R, Bates DW, Landrigan C, et al. Medication errors and adverse drug events in pediatric inpatients. *JAMA*. 2001;285(16):2114-20.
- 2) Horen B, Montastruc JL, Lapeyre-Mestre M. Adverse drug reactions and off-label use in paediatric outpatients. *Br J Clin Pharmacol*. 2002;54(6):665-70.
- 3) Hughes RG, Edgerton EA. First, do no harm: Reducing pediatric medication errors: Children are especially at risk for medication errors. *AJN*. 2005;105(5):79-84.

> **SAFETY wires** continued from page 4

(ISO) to develop small bore connectors for liquids and gases that cannot be misconnected to the wrong application, errors will still happen if the wrong syringe type is used. If nurses are in the habit of using a parenteral syringe to draw up medications to administer by mouth, the syringe can still be connected to an IV access port since they will both remain as Luer connectors. In this case, the nurse thought she was drawing up a parenteral medication in the parenteral syringe. But the error is a disappointing reminder that wrong route errors will happen despite the new ISO standards for various connector types if the wrong syringe type is used.

Please talk with clinical staff and make sure they understand the importance of using the correct connector/adaptor/syringe for the corresponding ISO-compliant device for medical liquids and gases so the impact of the global effort can be achieved. Coach nurses to recognize the risks they are taking when not verifying the transcribed order against the eMAR before drug administration. Remember, unsafe practice habits are widespread and require an understanding of the system issues driving and perhaps rewarding the at-risk behavior. In addition, knowledge deficits should be addressed when they are uncovered by an error.

2015-2016 ISMP Fellows

ISMP welcomes **Liz Hess, PharmD, MS**, the **2015-2016 ISMP Safe Medication Management Fellow**, sponsored by Express Scripts Foundation; **Major Bryan Bailey, PharmD, BCPS**, also a **2015-2016 ISMP Safe Medication Management Fellow**, as part of the US Army Medical Department's Training with Industry program; and **Briana Rider, PharmD**, the **2015-2016 FDA/ISMP Safe Medication Management Fellow**.

If you would like to subscribe to this newsletter, visit: www.ismp.org/sc?id=384



ISMP Nurse AdviseERR (ISSN 1550-6304) © 2015 Institute for Safe Medication Practices (ISMP). Subscribers are granted permission to redistribute the newsletter or reproduce its contents within their practice site or facility only. Other reproduction, including posting on a public-access website, is prohibited without written permission from ISMP. This is a peer reviewed publication.

Report medication and vaccine errors to ISMP: Call 1-800-FAIL-SAF(E), or visit www.ismp.org/MERP or www.ismp.org/VERP. ISMP guarantees the confidentiality of information received and respects the reporters' wishes regarding the level of detail included in publications.

Editors: Ann Shastay, MSN, RN, AOCN; Judy Smetzer, BSN, RN, FISMP; Michael Cohen, RPh, MS, ScD (hon), DPS (hon); Russell Jenkins, MD; Ronald S. Litman, DO. ISMP, 200 Lakeside Drive, Suite 200, Horsham, PA 19044. Email: ismpinfo@ismp.org; Tel: 215-947-7797; Fax: 215-914-1492.