ISMP Medication Safety Alert!®

A federally certified Patient Safety Organization

Nurse Advise-ERR®

Educating the healthcare community about safe medication practices

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Results of ISMP survey on High-Alert Medications:

Differences between nursing, pharmacy, and risk/quality/safety perspectives

ISMP extends thanks to the 772 practitioners who completed our survey on high-alert medications between October 2011 and February 2012. We sincerely appreciate your input as we update the **ISMP List of High-Alert Medications for Acute Care Settings** in 2012. High-alert medications can be defined as those medications that bear a heightened risk of causing significant patient harm when they are used in error. Although mistakes may or may not be more common with these drugs, the consequences of errors are often harmful, sometimes fatal, to patients. Highlights from the survey follow.

Practitioners' views. Table 1 shows the percent of respondents who consider the drugs in our survey to be high-alert medications. These findings are similar to responses we received during our 2007 survey on high-alert medications (www.ismp.org/Newsletters/nursing/Issues/NurseAdviseERR200706.pdf), with a few notable exceptions:

- Antithrombotics rose from the eighth to the third most frequent medication/class considered a high-alert medication by respondents.
- There was a large increase between 2007 (76%) and 2012 (86%) in the percent of respondents who felt subcutaneous insulin should be considered a high-alert medication.
- The largest change in the percent of respondents who felt a medication should be considered high-alert was observed with IV oxytocin; 58% felt it was a high-alert drug in 2007 while 71% consider it a high-alert drug in 2012.
- The percent of respondents who felt parenteral nutrition should be considered a high-alert medication rose from 55% in 2007 to 64% in 2012.
- Sterile water for injection, inhalation, and irrigation in containers of 100 mL or greater was the drug least frequently considered a high-alert medication in 2012.

Chemotherapy topped the list in both 2007 and 2012, with IV insulin, antithrombotic agents, epidural/intrathecal medications, and potassium chloride injection rounding out the top five medications considered by respondents to be high-alert medications. Subcutaneous insulin and IV narcotics and opioids ranked ninth and twelfth respectively, although at least 80% of all respondents believe these medications should be considered high-alert

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Table 1. Drugs Considered High-Alert Medications *(continued on page 2)*

	Considered High-Alert by Respondents (%)	Considered High-Alert at Practice Sites, with Precautions in Place (%)
Chemotherapy, oral and parenteral	98	93
Insulin, IV	96	93
Antithrombotic agents	96	93
Epidural or intrathecal medications	95	82
Potassium chloride injection	93	89
Neuromuscular blocking agents	93	83
Anesthetic agents	89	74
Potassium phosphate injection	87	80
Insulin, subcutaneous (including pens and pumps)	86	84
Adrenergic agonists, IV	84	69
Sodium chloride injection, greater than 0.9%	81	70

safetywires

Imogam Rabies-HT strength easy to confuse. A patient visited an emergency department (ED) after being exposed to a bat. Rabies immune globulin and vaccine were prescribed as per the Centers for Disease Control and Prevention (CDC) post-exposure guidelines. In calculating the dose and volume to give, an ED nurse misread the concentration on the carton label of the **IMOGAM RABIES-HT** (rabies immune globulin [human]) which almost led to a dosing error. **Figure 1** shows the way the concentration is listed on the package. The nurse saw "150 IU" and "2 mL" and misinterpreted the strength as "150 IU/2 mL." The nurse missed the fact that the strength is expressed as 150 international units per mL. Fortunately, the error was recognized before the wrong amount was given. We have contacted Sanofi Pasteur, the manufacturer of Imogam, about the near miss and asked about realigning the statement about the strength on the Imogam Rabies-HT package. In the meantime, consider having pharmacy prepare each patient specific dose.

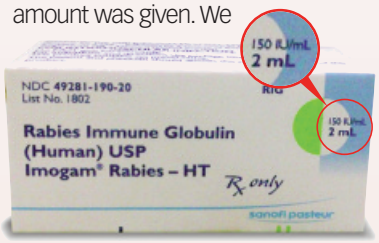

Figure 1. Strength mistakenly seen as 150 international units per 2 mL.

Infusion reconnected to the wrong patient. Both patients in a semi-private room had been disconnected from their primary IV solutions so they could take showers. Each patient's primary solution hung on a separate mobile IV pole, but both poles were right next to each other between the two patients' beds. Afterwards, a nurse went into the room to start a piggyback

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Baxter

Supported by educational grants from Baxter and BD

BD

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medications. Joining sterile water for injection, inhalation, and irrigation (100 mL or greater) as the least likely to be considered high-alert medications were oral hypoglycemics, liposomal medications and their counterparts, IV adrenergic antagonists, and IV promethazine.

Practice site adoption. Respondents also reported if their practice sites treated each drug in the survey as a high-alert medication, with special precautions in place to prevent errors and harm. **Table 1** (beginning on page 1), shows the differences between practitioners' beliefs that the medication should be considered high-alert and practice site adoption of safety precautions for the drug.

The drugs or drug classes treated as high-alert medications *in at least 80%* of respondents' practice sites included:

- Chemotherapy, parenteral/oral (93%)
- Antithrombotic agents (93%)
- Insulin, IV (93%)
- Potassium chloride injection (89%)
- Insulin, subcutaneous (84%)
- Neuromuscular blocking agents (83%)
- Epidural/intrathecal medications (82%)
- Potassium phosphate injection (80%).

The drugs or drug classes treated as high-alert medications *in less than half* of respondents' practice sites included:

- Sterile water for injection/inhalation/irrigation in containers of 100 mL or greater (24%)

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Table 1. *(continued from page 1)* **Drugs Considered High-Alert Medications**

	Considered High-Alert by Respondents (%)	Considered High-Alert at Practice Sites, with Precautions in Place (%)
Narcotics and opioids, IV	81	74
Moderate sedation agents, oral, for children	80	65
Cardioplegia solution	80	59
Nitroprusside sodium, IV	76	63
Dextrose, hypertonic, 20% or greater	74	59
Magnesium sulfate injection	71	65
Moderate sedation, IV	71	62
Oxytocin, IV	71	58
Narcotics and opioids, transmucosal and oral	70	58
Antiarrhythmic, IV	70	55
Inotropic medications, IV	66	51
Narcotics and opioids, transdermal (fenta**NYL**)	66	56
Parenteral nutrition formulations	64	58
Methotrexate, oral, non-oncologic use	63	58
Opium tincture	63	50
Epoprostenol (Flolan), IV	63	47
Dialysis solutions, peritoneal and hemodialysis	61	44
Radiocontrast agents, IV	58	46
Promethazine, IV	56	49
Adrenergic antagonists, IV	54	44
Liposomal forms of drugs and conventional counterparts	50	38
Hypoglycemic, oral	38	31
Sterile water for injection, inhalation, and irrigation in containers 100 mL or greater	33	24

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antibiotic for one of the patients, but she realized she had not restarted the patient's primary infusion. After reconnecting the primary infusion, the nurse attached the piggyback antibiotic solution to a port in the primary infusion tubing. After making the connection, she then traced the tubing from the antibiotic back to the primary infusion tubing. Although she did not trace the primary infusion tubing to the patient's access point, the nurse realized she had connected the wrong primary line to the patient. She immediately disconnected the roommate's primary line from the patient, who had been exposed to potential bloodborne pathogens while being connected to the wrong IV tubing. When connecting or reconnecting any infusions, always verify the actual solution in the container, and then trace the line from the solution to the patient's correct access point (route) before making any attachments. In some hospitals, nurses trace the line from the patient's access point outward to the solution, and then conduct a second trace from the solution to the patient. Whatever process you use—tracing access point to solution, solution to access point, or both—be sure to verify all line attachments *before* making them. Also, whenever you reconnect an IV infusion or medication to a patient, proper patient identification should occur using two unique patient identifiers and comparing the infusion to the electronic medication administration record. It is also a good idea to avoid keeping IV poles next to each other if they are being used for different patients.

Mix-up between PPD and IPV. A medication error occurred at an immunization clinic when a public health nurse, intending to administer a tuberculin (purified protein derivative [PPD]) skin test, mistakenly administered 0.1 mL of injectable inactivated polio vaccine (IPV) intradermally. The nurse noticed the error immediately, and the appropriate test was administered using 0.1 mL of PPD. The effects of the intradermal IPV

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- Hypoglycemics, oral (31%)
- Liposomal forms of drugs and conventional counterparts (38%)
- Adrenergic antagonists, IV (44%)
- Dialysis solutions (44%)
- Radiocontrast agents, IV (46%)
- Epoprostenol, IV (47%)
- Promethazine, IV (49%).

For every drug in the survey, more respondents believed the drug should be considered a high-alert medication than actual practice site adoption of the drug as a high-alert medication with safety precautions in place. The gap between respondents' beliefs and practice site adoption was often large, particularly for cardioplegia solutions, hypertonic dextrose greater than 20%, dialysis solutions, epoprostenol, and anesthetic agents. The gap between respondents' beliefs and actual practice site adoption was lowest for insulin (IV and subcutaneous), antithrombotics, potassium chloride injection, and methotrexate (oral, non-oncologic use). The adoption of safety precautions for most of the drugs/classes of drugs in the survey increased between 2007 and 2012, with the largest gains seen with IV oxytocin, antithrombotics, subcutaneous insulin, methotrexate (oral, non-oncologic use), and narcotics and opioids (all routes).

Differing views. As in the 2007 survey, interesting differences emerged between nurses' and pharmacists' perceptions regarding which drugs they consider to be high-alert (**Table 2**). In general, nurses identified the drugs listed below as high-alert medications more often than pharmacists:

- Adrenergic antagonists, IV (32% more than pharmacists)
- Oxytocin, IV (30% more)
- Dialysis solutions (26% more)
- Radiocontrast agents, IV (23% more)
- Antiarrhythmics, IV (18% more)
- Nitroprusside sodium, IV (17% more)

With these drugs, nurses may feel more vulnerable to harmful errors, particularly since the pharmacy may not prepare all doses/infusions of these medications. Nurses may have witnessed transient harm with these drugs in critical care settings, providing greater awareness of

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Table 2. Medications Considered High-Alert by Respondents

	Considered High-Alert Medications (%)	
	Nurses (n=388)	Pharmacists (n=253)
Classes/Categories of Medications		
Adrenergic antagonists, IV	65	33
Antiarrhythmics, IV	76	58
Dialysis solutions, peritoneal and hemodialysis	71	45
Inotropic medications, IV	68	59
Moderate sedation agents, IV	76	61
Moderate sedation agents, oral, for children	86	70
Narcotics and opioids, IV	77	84
Narcotics and opioids, transdermal (fenta**NYL**)	67	64
Radiocontrast agents, IV	67	44
Specific Medications		
Insulin, subcutaneous (including pens and pumps)	84	90
Magnesium sulfate injection	74	65
Methotrexate, oral, non-oncologic use	55	74
Nitroprusside sodium, IV	82	65
Oxytocin, IV	82	52
Promethazine, IV	51	61
Sodium chloride injection, greater than 0.9% concentration	71	94
Sterile water for injection, inhalation, and irrigation in containers of 100 mL or more	21	53

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injection on the patient were limited to a 20 mm by 15 mm area of erythema at the injection site 72 hours post injection and complaints of mild tenderness upon palpation. Since the error was recognized immediately, the area of erythema was not mistaken as induration and misread as a positive PPD. The vial of polio vaccine had been placed accidentally in the PPD carton, and the PPD vial had been incorrectly placed in the polio vaccine carton. The nurse did not notice the switch until after the polio vaccine was administered in error. Documenting the vaccine vial lot number prior to administration helps ensure reading of the label. Also, differences in lot number formats may draw attention to a possible error. Actual vaccine administration should be documented after administration. Staff must store PPD in its original carton since it is light sensitive. But for products that aren't light sensitive, cartons should be discarded once the products are opened, thus reducing the chance that vials will wind up in the wrong cartons. When returning a product to its storage location, the label must be read again to verify the drug—similar to the final step of reading the label of unit-dose packages for the third time before discarding the product wrapper.

ISMP errata. In the January 2012 newsletter we stated, "When a multi-dose vial is opened and accessed it should be dated with the date it was opened and discarded after 28 days unless the manufacturer specifies a shorter expiration date." In fact, we should have stated that once a vial cap is removed or the vial is punctured, the manufacturer's expiration date is no longer valid and a revised expiration date (not the date the vial was opened), must be documented on the label. This revised date (also called beyond-use date) should be no longer than 28 days unless the manufacturer specifies otherwise, according to the Joint Commission, the United States Pharmacopeia, and the Association for Professionals in Infection Control and Epidemiology recommendations. We apologize for the confusion.

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the potential for harm with these drugs.

On the other hand, pharmacists identified the drugs listed below as high-alert medications more often than nurses:

- Sterile water for injection, inhalation, and irrigation (containers 100 mL or greater) (32% more than nurses)
- Sodium chloride injection, greater than 0.9% concentration (23% more)
- Methotrexate, oral, non-oncologic uses (19% more)
- Promethazine, IV (10% more)

For these drugs, findings suggest that pharmacists may have a greater awareness of the risk of harm associated with errors involving these drugs than nurses.

Risk/quality/safety managers viewed the drugs listed below as high-alert more often than either pharmacists or nurses:

- Moderate sedation, IV, and oral for children (10% more than nurses or pharmacists)
- Inotropic drugs, IV (14% more)
- Promethazine, IV (12% more)
- Magnesium sulfate injection (8% more)

These differences can be explained by the knowledge risk/quality/safety managers often have regarding the drugs that have caused patient harm. This knowledge often stems from internal and external error-reporting databases, malpractice claims and judgments, patient complaints, and sentinel events.

Suggested additions. In the survey, ISMP provided five drugs/classes of drugs to consider for addition to the high-alert list (Table 3). These drugs—antiretroviral agents, arginine, carBAMazepine, colistin, and metFORMIN—received an affirmative response from about one-third of respondents. We also asked respondents to tell us if they thought fentaNYL transdermal, methadone, and HYDROmorphone should be given special emphasis, although each resides within a class of drugs already considered high-alert medications. Nearly three-quarters agreed to this with HYDROmorphone, and about two-thirds agreed to this with methadone and fentaNYL patches.

Respondents also suggested adding other medications to our list. We appreciate all the thought that went into making these suggestions. However, to keep the list manageable, we narrowed the potential additions to a few medications—vasopressin, dexmedetomidine, and special emphasis on U-500 insulin—which we will be evaluating during the next few weeks. We will also determine whether any drugs currently on our list should be removed.

Using the survey findings. ISMP will be updating our list of high-alert medications based on these survey findings, along with evidence from medication error reporting programs to which we have access, opinions of safety experts, and published research that identifies drugs associated with harmful errors. We will publish the updated list in this newsletter and post it on our website in March 2012. Meanwhile, we hope you will use these survey findings to engage in discussions about high-alert medications in your organization. Focusing on differing nursing and pharmacy perspectives as to which drugs should be considered high-alert medications may prove worthwhile, as would learning about gaps in practice site adoption of safety precautions for drugs staff perceive to be high-alert medications.

Table 3. Possible Additions to the High-Alert List

	Considered High-Alert by Respondents (%)	Considered High-Alert at Practice Sites (%)
Arginine, IV	38	27
Colistin, all parenteral routes	38	25
met**FORMIN**	31	29
Antiretroviral agents, oral	30	20
car**BAM**azepine, oral	28	22
HYDROmorphone, listed separate from opioids class	73	62
fenta**NYL** transdermal, listed separate from opioids class	65	56
Methadone, listed separate from opioids class	64	54

Special Announcements

Unique 2-day program. Attend ISMP's ***Medication Safety INTENSIVE*** workshop, an interactive program that provides a basis for effective approaches to medication safety. Sharpen your risk assessment and event investigation skills, and learn more about Just Culture, Lean Six Sigma, high-leverage error-reduction strategies, and more. The workshop will be held in Orlando, FL, on **March 8-9**. For details, visit: www.ismp.org/educational/MSI.

ISMP webinar. Join ISMP on **March 6** for a webinar on ***Reducing Hospital Readmissions Through Medication Use Optimization***. Beginning in 2013, the Centers for Medicare & Medicaid Services (CMS) will be withholding reimbursement for hospital readmissions. Learn what medications are associated with hospital readmissions, as two pharmacists discuss medication-related readmission reduction programs implemented at their institutions and their impact on readmission rates. For details, visit: www.ismp.org/educational/webinars.asp.

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NURSES

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ISMP Safe Medication Management Fellowship

FDA ISMP Safe Medication Management Fellowship

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ISMP Safe Medication Management Fellowship

Date and Location: The 12-month Fellowship commences in July 2012 at the Horsham, PA (near Philadelphia) office of the Institute for Safe Medication Practices (ISMP). Relocation to the Philadelphia area is required.

Description: This ISMP Fellowship program helps prepare healthcare professionals to lead the way in medication safety. The unique year-long Fellowship offers an experienced healthcare professional an unparalleled opportunity to learn from and work with some of the nation's top experts in medication safety and benefit from the Institute's years of experience and solid reputation. Now in its 20th year, the Fellowship allows the candidate to work collaboratively in various kinds of healthcare settings to develop and implement interdisciplinary error-prevention strategies. Graduates of this program have been sought for employment in medication safety positions in healthcare systems, regulatory agencies, the pharmaceutical industry, and ISMP.

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Date and Location: This 12-month Fellowship commences in July 2012. The candidate will spend 6 months at ISMP in Horsham, PA (near Philadelphia) and 6 months at the FDA in Silver Spring, MD (near Washington, DC). Relocation to the Philadelphia and Silver Spring areas are required.

Description: This Fellowship program is a joint effort between ISMP and the US Food and Drug Administration (FDA), Center for Drug Evaluation and Research, Office of Surveillance and Epidemiology, and Division of Medication Error Prevention and Analysis (DMEPA). The Fellowship allows the candidate to benefit from ISMP's years of experience devoted to medication error prevention and safe medication use. At the FDA, valuable regulatory experience is gained by working with the division focused on medication error prevention. Six months in each organization enhances the Fellow's opportunity to work with a diverse group of medication safety experts.

Candidate Qualifications (for either Fellowship)

Applicants must be healthcare professionals with at least 1 year of postgraduate clinical experience (or have completed a residency program for the FDA-ISMP joint Fellowship). Pharmacists, physicians, physician assistants, nurse practitioners, and nurses with risk management, quality improvement, or patient safety experience are welcome to apply. FDA and ISMP seek dedicated individuals with a strong commitment to improving medication safety, the ability to work in a fast-paced and often-changing environment, and a high comfort level with working independently or in a collaborative process.

How to Apply: Information and applications can be found at: www.ismp.org/profdevelopment/. Applications can also be requested by calling **215-947-7797** or via email to fellowship@ismp.org.

All applications must be submitted by March 30, 2012.