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# USP Patient Safety CAPSLink™

November  
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Happy  
Thanksgiving



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### USP Patient Safety CAPSLink™

This message has been sent to you as a service of the U.S. Pharmacopeia, Center for the Advancement of Patient Safety (CAPS). USP is a not-for-profit, non-governmental organization that promotes the public health by establishing state-of-the-art standards to ensure the quality of medicines and other health care technologies. CAPS is a component of USP's Patient Safety public health program. The USP Center for the Advancement of Patient Safety was created to encourage medication error reporting, conduct data analysis and research, develop educational programs, and propose standards, recommendations, and guidelines that ultimately improve the safety and quality of patient care.

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### **Errors in Obstetrics**

(This is an edited version of an article that appeared in *Lifelines* April/May 2004; a publication of the Association of Women's Health, Obstetric and Neonatal Nurses<sup>1</sup>. © AWHONN 2004).

Medication errors can occur in any clinical area within a hospital or health system - including specialty areas like labor and delivery (L&D), obstetrical recovery

(OBR) and maternity units (MU)<sup>1</sup>. Data submitted to USP's MEDMARX<sup>SM</sup> program over a 28-month period from 1998 to 2002 revealed that nearly 3,800 errors originated in these three areas (Table 1).

Table 1. Number of Errors by Obstetrical Area

Obstetrical Area	n	Percent
Labor and Delivery	1,844	49
OB Recovery	371	10
Maternity Unit	1,560	41
Total	3,775	100%

The largest portion of errors for each of the three areas did actually reach the patient, but did not result in harm (Category C). [See [www.NCCMERP.org](http://www.NCCMERP.org) for complete Category Definitions]. The L&D area had the highest percentage of reported harmful errors (Categories E-I) at 5 % followed by the OBR (1.9%) and MU (1.6%) areas (Table 2). The harm threshold of 5% in the L&D is more than twice the 2.28% average threshold of harm for MEDMARX data for years 1998-2003.

Table 2. Error Category Index<sup>a</sup>

Error Category	L&D n (%)	OBR n (%)	MU n (%)	Total	%
Potential Error					
A	0 (0)	0 (0)	5 (0.3)	5	0.1
Intercepted Error					
B	270 (14.6)	108 (29.1)	374 (24)	752	19.9
Error_Reaches_Patient_No_Harm					
C	1,263 (68.5)	219 (59)	1,003 (64.3)	2,485	65.8
D	221 (12)	37 (10)	152 (9.7)	410	10.9
Error, Harm					
E	73 (4)	6 (1.6)	24 (1.5)	103	2.7
F	13 (0.7)	1 (0.3)	2 (0.1)	16	0.4
G	0 (0)	0 (0)	0 (0)	0	0
H	3 (0.2)	0 (0)	0 (0)	3	0.1
Error, Death					
I	1 (0.1)	0 (0)	0 (0)	1	0.03

a. For complete description of error categories A-I see [www.nccmerp.org](http://www.nccmerp.org)

*Omission error and Improper dose/quantity* were the top two most frequently

reported **Types of Error** for L&D and OBR. *Omission error* and *Unauthorized/wrong drug* were the most frequently reported error types for the MU area. (Table 3).

Table 3. Top Types of Error by Obstetrical Area

Type of Error	L&D		OBR		MU	
	n	%	n	%	n	%
Omission error	497	28.6	130	36.0	486	32.8
Improper dose/quantity	379	21.8	64	17.7	218	14.7
Wrong time	265	15.3	29	8.0	166	11.2
Unauthorized drug	228	13.1	36	10.0	247	16.7
Prescribing error	137	7.9	55	15.2	154	10.4
Extra dose	83	4.8	22	6.1	96	6.5

The most frequently reported **Cause of Error** for all three obstetrical areas was *Performance deficit* (Table 4). However, the second and third top causes differed depending on the area and alternated between *Procedure/protocol not followed* and *Documentation*. *Communication*, *Knowledge deficit*, and *Transcription inaccurate/omitted* were also frequently cited causes of error.

Table 4. Top Ten Causes of Error by Obstetrical Area

Cause of Error	Labor		OB Recovery		Maternity	
	n	%	n	%	n	%
Performance deficit	850	49.1	140	40.1	689	47.3
Procedure/protocol not followed	429	24.8	59	16.9	349	23.9
Communication	306	17.7	44	12.6	175	12.0
Knowledge deficit	160	9.2	36	10.3	157	10.8
Documentation	158	9.1	65	18.6	198	13.6
Transcription inaccurate/omitted	111	6.4	50	14.3	147	10.1
Dispensing device involved	90	5.2	8	2.3	68	4.7
System safeguard(s)	78	4.5	9	2.6	99	6.8
Pump, improper use	71	4.1	7	2.0	27	1.9
Drug distribution system	70	4.0	7	2.0	82	5.6

A review of the products cited in these error records revealed that more than 300 different medications were involved: L&D (n=199 products), OB recovery (n=137 products), and MU (n=197 products). For all three clinical areas, insulin and cefazolin are among the most commonly reported products (Table 5).

Table 5. Common Products Involved in Errors by Obstetrical Area

<b>Labor and delivery</b>		
<b>GENERIC NAME</b>	<b>n</b>	<b>Percent</b>
Ampicillin	196	12.5
Magnesium Sulfate	121	7.7
Oxytocin	111	7.1
Penicillin G	69	4.4
Cefazolin	58	3.7
Insulin	46	2.9
Morphine	44	2.8
Terbutaline	43	2.7
<b>Obstetrical recovery</b>		
<b>GENERIC NAME</b>	<b>n</b>	<b>Percent</b>
Cefazolin	14	4.7
Insulin	12	4.0
Albuterol	10	3.3
Potassium Chloride	10	3.3
Warfarin	10	3.3
Ketorolac	8	2.7
Furosemide	7	2.3
Ibuprofen	7	2.3
Vancomycin	7	2.3
<b>Maternity</b>		
<b>GENERIC NAME</b>	<b>n</b>	<b>Percent</b>
Ampicillin	73	5.8
Acetaminophen and Oxycodone	55	4.4
Ibuprofen	50	4.0
Cefazolin	46	3.6
Gentamicin	45	3.6
Ketorolac	40	3.2
Insulin	37	2.9
Meperidine	34	2.7
Acetaminophen and Hydrocodone	32	2.5
Magnesium Sulfate	30	2.4

A review of error descriptions shows several reoccurring practice problems:

- Misprogramming infusion pumps
- Misconnected or disconnected IV tubing
- Administering peripheral IV solutions through the epidural catheter
- Omission of antibiotic prophylaxis per protocol
- Lack of drug allergy information at time of drug administration

- Incomplete communication and documentation

### **Selected Case Reports**

**Case #1:** An IV pump was originally programmed to deliver 2 mL/minute of a pitocin infusion but was inadvertently changed to deliver 20 mL/minute. This resulted in the patient receiving a 10-fold overdose for several minutes before the error was discovered. The patient developed tetanic contractions lasting 6 minutes. The pitocin IV was stopped, the patient's obstetrician was called and the patient was given a bolus of fluid, terbutaline, and oxygen. The baby's fetal heart rate experienced 5 minutes of deceleration in the 50 - 80 beats per minute range, but returned to baseline in the 120's. The uterine tone also returned to normal.

**Case #2:** An epidural infusion consisting of bupivacaine 0.1% with epinephrine and 0.8 mcg/mL fentanyl was ordered to infuse at 15mL/hour. The patient was also receiving lactated ringers solution as the maintenance IV to be infused at 125mL/hour. A nurse discovered however, that the epidural IV line (in channel A of the IV pump) was infusing at 125mL/hour while the lactated ringers was labeled as an epidural in channel B infusing at 15mL/hr. The patient inadvertently received the excessive dose of bupivacaine/epinephrine/fentanyl over approximately 2 hours. The infusions were stopped, ephedrine and fluids were given bolus, vitals monitored every 5 minutes and the epidural was resumed when the patient was ready for delivery. There were no adverse outcomes for the mother or baby.

**Case #3:** In preparing for a scheduled caesarian section, the anesthesia provider prepared a pitocin infusion (20 units in 1000 mL) that was intended to be given following delivery of the placenta. The IV tubing was primed with the pitocin solution, however, the anesthesia provider failed to close the roller clamp. About 300 mL of the pitocin solution rapidly infused prior to the induction of anesthesia or the surgical incision. The patient experienced titanic uterine contractions and the baby's heart rate decreased to 60-70 beats per minute. An emergency caesarian section had to be performed. The mother and baby recovered without permanent harm.

**Case #4:** Upon admission, a patient stated she was allergic to sulfa and cefaclor. A physician in labor and delivery ordered cefotetan 1 gram IV now. After the drug was administered, the patient developed a flushed face, welts, and complained of itching on the face, back, and chest.

**Case #5:** A physician ordered insulin 10 units in 100mL of normal saline to be infused at 1 unit/hour (10mL/hour or 0.1unit/mL). The pharmacy prepared the IV bag as ordered, however, the administering nurse thought the standard insulin concentration was 1unit/mL and therefore programmed the pump to infuse the insulin bag at 1 mL/hour (0.1unit/hour) resulting in a 10 fold under dosing. Several hours later, the patient's blood glucose levels were elevated prompting the physician to order an increase in the insulin infusion rate to 11 mL/hour. The error was discovered when nursing requested an additional IV bag from the pharmacy.

## Suggestions to Improve Medication Safety in Obstetrical Areas<sup>1</sup>

1. Administer bolus doses of magnesium sulfate from a magnesium sulfate admixture bag prepared by the pharmacy department and not from the maintenance solution.
2. Require independent verification of infusion pump settings by two nurses, especially with pitocin and magnesium sulfate solutions.
3. Review policies and procedures for documenting patient's drug allergies and identify points in the medication use process where this information is not readily available (e.g., when medications are accessed from an automated dispensing device or when the medication is administered in haste) to avoid errors associated with drug allergies.
4. Review policies and procedures around the administration of antibiotic prophylaxis for Group B Streptococcus-positive patients. [Note: Data findings show that some healthcare providers failed to administer the antibiotic prior to delivery of the infant].
5. Use luer-lock connectors at all IV tubing points.
6. Clearly label IV solutions, tubings, and connections with a unique labeling system that would identify the solution being infused.

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1. Beyea, SC, Kobokovich, LJ, Becker, SC, Hicks, RW. Medication Errors in the LDRP: Identifying Common Errors Through MEDMARX<sup>SM</sup> Reporting. AWHONN Lifelines 2004 8:130-140.



### 1. USP Practitioners' Reporting News

Ethyl Chloride is Flammable: USP's Medication Errors Reporting (MER) Program has received two reports concerning ethyl chloride when used with electrical cautery equipment. [Click here to read more.](#)

Another product that may ignite while being used with electrical equipment is Lacri-Lube® S.O.P®. In August 2001, USP issued a *Practitioners' Reporting News* item where Lacri-Lube® S.O.P® ignited during laser surgery. To view additional error reports covering a variety of different issues submitted to USP's Medication Errors Reporting Program see: [Click here to read more.](#)

Practitioner's can learn from your experiences. If you have similar cases to share, report them to MER at [www.usp.org/patientSafety/reporting/mer](http://www.usp.org/patientSafety/reporting/mer). Reporting forms can also be printed at that address, or requested by calling 1-800-23-ERROR (1-800-233-7767).

## **2. Sleep Deprivation of Medical Interns Impacts Patient Safety**

A study of sleep and medical intern performance by Brigham and Women's Hospital (Boston, MA) found evidence that indicates eliminating extended work shifts of 24 hours or more, implementing shift limits of 16 hours or less, and reducing work weeks to less than 80-hours, decreases the number of medical errors performed by this group of physicians. The study was published in the October 28, 2004 issue of the *New England Journal of Medicine*. This research was supported by grants from the Agency for Healthcare Research and Quality and the National Institute for Occupational Safety and Health.

<http://content.nejm.org/cgi/content/abstract/351/18/1829>

## **3. Syringe Packaging Creates Problems**

The Pennsylvania Patient Safety Authority recently issued an alert regarding reports of confusion between the packaging of Insulin and Tuberculin (TB) Syringes. The TB syringe is packaged in a white wrapper with black and orange print with an orange plunger tip which is the same color used on insulin syringes. [Click here to read more.](#)

## **4. AHRQ WebM&M Patient Safety Journal**

Two cases in the latest issue of AHRQ WebM&M focus on the potential risks of healthcare information technology. In the first case a patient's planned move from one hospital room to another was documented in the electronic record before it actually occurred, nearly leading to a wrong-patient medication error. In the second case, an electronic health record failed to prevent (and may have even contributed to) an overdose of medications for the prevention of angina.

<http://webmm.ahrq.gov/>

## **5. FDA Updates**

FDA Sponsors an Institute of Medicine study: In response to recent negative publicity surrounding the flu vaccine shortage and the withdrawal of Vioxx®, the FDA has asked the Institute of Medicine (IOM) to study the drug-safety system in the United States and implement an internal system for adjudicating differences of professional opinion. [FDA announcement](#)

Adjusting Lovenox Dosage for Severe Renal Impairment: Aventis Pharmaceuticals has revised the labeling for the anticoagulant drug Lovenox (enoxaparin sodium injection) stressing the need to adjust the dose in patients with severe renal impairment-that is, those with a creatinine clearance of less than 30 mL per minute. These patients don't clear and eliminate the drug normally, and may require a lower dose to prevent bleeding...

<http://www.accessdata.fda.gov/psn/transcript.cfm?show=33#4>

## **6. Pediatric Resuscitations Prone to Medication Errors**

A recent study published in the *British Medical Journal* shows medication errors occur during pediatric resuscitations more frequently than previously estimated. Physicians neglected to specify the dose in 17% (21) of the 125 orders that were given during the experiment. The researchers recommend that pediatric emergency departments provide team training regularly to physicians and nurses who work together during resuscitations.

<http://bmj.com/cgi/reprint/bmj.38244.607083.55v1?etoc>

## **7. New Tool Helps Hospitals Assess Patient Safety Culture**

AHRQ recently announced a new survey tool to help hospitals and health systems evaluate employee attitudes about patient safety in their facilities. The survey titled *-Hospital Survey on Patient Safety Culture*, addresses the critical role that organizational conditions play in improving patient safety. AHRQ is collaborating with Premier, Inc., the Department of Defense, and the American Hospital Association in hosting a toll-free audioconference in January 2005 to help health professionals adopt and use the survey. See

<http://www.ahrq.gov/news/press/pr2004/hospcult2pr.htm> and select to view the [survey](#). A print copy may be ordered by sending an e-mail to [ahrqpubs@ahrq.gov](mailto:ahrqpubs@ahrq.gov)

## **8. Leapfrog and ISMP Release Survey Findings on Hospital Safety**

Two surveys on hospital safety were recently released and found that there has been some improvement with certain patient safety issues (e.g., preventing wrong-site surgery or administering the wrong drug). However, the reports also show there was still ample room for improvement in many other areas. According to the Leapfrog Group's first Hospital Quality and Safety Survey, only 21% of facilities are in compliance with 27 safety practices created by the National Quality Forum and another 39% of the hospitals had fully implemented at least one of the four measured categories. [www.leapfroggroup.org](http://www.leapfroggroup.org)

The Institute for Safe Medication Practices (ISMP) found that surveyed hospitals had made substantive advances in reducing and preventing medication errors, with the number of hospitals implementing the organization's "safe practice recommendations" increasing by 20% since 2000. In addition, the number of hospitals that use "nonpunitive, systemized approaches to error prevention," such as creating an environment that encourages staff to report errors and "near misses," has increased by 43%. Despite these advances, ISMP stated that more steps need to be taken to prevent medication errors, including developing federal standards for drug design and labeling.

<http://www.ismp.org/Survey/Hospital/Intro.htm>

## **9. CAPSLink Reader Survey Coming in 2005**

In an effort to continuously improve the quality of the CAPSLink newsletter, USP is planning to survey readers in January on the value and utility of the information provided by this publication. The intent of the survey is to gauge the perceived value of the format of information, recommendations, and news items. USP is also considering including in *CAPSLink* a "question of the month" to obtain

examples of successful methods and strategies for reducing medication errors. Information collected from these questions will then be shared with readers the following month in an effort to advance systems solutions and safe practices.

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#### USP Medication Error Reporting Programs:



**MEDMARX<sup>SM</sup>**—USP's comprehensive, Internet-accessible, anonymous medication errors reporting program, and quality improvement tool. The program facilitates productive and efficient documentation, tracking, trending, and prevention of medication errors.



**Medication Errors Reporting (MER) Program**—presented in cooperation with the Institute for Safe Medication Practices, this nationwide program makes it possible for health professionals to report medication errors confidentially and anonymously to USP.

#### Other USP patient safety resources:

- [MEDMARX Annual Data Summary reports](#)—provides readers with a wealth of information on reported error events including patterns in the types, causes, and level of harm associated with medication errors.
- [Understanding and Preventing Medication Errors: A Resource for Healthcare Practitioners](#)—a CD toolkit with practical guidelines, forms, and templates to help healthcare facilities improve error-reduction initiatives.
- [Advancing Patient Safety in U.S. Hospitals: Basic Strategies for Success](#)—a book in which hospitals share stories about how they reduced medication errors and promoted safer patient care.

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