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USP Patient Safety CAPSLink™

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In this Issue

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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Section I: Medication Error Analysis

Examining Medication Errors Prevented by and Associated with Bar-Code Medication Administration (BCMA) Technology

Section II: In the News...

1. USP Webinars: Examining Errors in the Perioperative Setting
2. Joint Commission Rescinds Interim Rule on MM.4.10
3. FDA Begins Audio Broadcasts on Emerging Drug Safety Information
4. Boston Hospitals Reveal Accreditation Survey Results
5. Smart Pumps Are Not Independently Smart
6. FDA Issues Adverse-Event Reporting Guidelines for Researchers
7. WHO Releases Nine Life-saving Patient Safety Solutions
8. ISMP-USP Workshop: Using Data Effectively to Manage the Risks to Medication Safety

9. ISMP Issues Recommendations to Decrease Heparin and Insulin Errors



Examining Medication Errors Prevented by and Associated with Bar-Code Medication Administration (BMCA) Technology^a

Bar-code medication administration (BCMA) technology is one type of technological solution that is being used to prevent medication errors. This technology involves placing a unique identifier (bar code) that is machine readable by an optical scanner on each individual medication package/dose. The drug specific bar code encodes the National Drug Code (NDC), which includes the drug's manufacturer, the name and strength of the drug and the size of package.¹ An additional bar code is affixed to the wristband or identification bracelet of all hospitalized patients to ensure positive patient identification before any medication is administered.²

As reported in a 2005 national survey of hospital pharmacy practice conducted by the American Society of Health-System Pharmacists, approximately 9% of hospitals use BCMA technology.³ BCMA technology is focused on preventing medication errors before they reach a patient. This is particularly important during the administration phase of the medication use process where there are fewer opportunities to intercept errors as compared to the prescribing, transcribing, or dispensing phases. BCMA technology is designed to match the right medication with the right patient at the right time before any medication is administered.

Although BCMA technology has proven to be effective in preventing medication errors, there are also reports implicating new errors resulting from its use. From January 1, 2000 through December 31, 2005 error reports from 65 hospitals and related health systems were submitted to USP's MEDMARX[®] program that included some variation of the phrase "bar code" in the error description. Over 500 reports were evaluated and divided into two categories: 70 reports in which BCMA technology prevented an error from reaching the patient and 445 reports in which the error was a consequence of BCMA technology.

Errors Prevented by BCMA Technology

Table 1 provides a synopsis of the 70 medication errors that were

prevented by BCMA technology in the dispensing or administration phases of the medication use process. Fifty-one (73%) of the errors originated in the dispensing phase. In 18 (35%) of the 51 dispensing errors, a nurse, using BCMA technology to scan the product at the point of drug administration, detected that a wrong medication had been dispensed by the pharmacy. In 14 (28%) of these 51 dispensing errors, providers detected the wrong dose of the correct medication. Frequently, the cause of the wrong dose errors were attributed to similarity of the drug packaging before the product was released from the pharmacy. Eleven (22%) of the 51 reported dispensing errors were stocking or storage errors, typically associated with automated dispensing devices.

Of the 70 prevented medication errors, 19 (27%) originated during drug administration and were intercepted by nurses using BCMA technology. In 11 of these 19 reports, nurses received an “early dose warning,” which prevented the error. In eight cases, the alert came as the nurse tried to administer a medication when no order existed.

Table 1. Types of Errors Prevented by BCMA Technology by Phase of Medication Use Process ^a

Type of Error Prevented	Dispensing (n = 51)		Administration (n = 19)	
	n	%	n	%
Incorrect medication dispensed	18	37	0	0
Incorrect dose dispensed	14	28	0	0
Stocking or storage errors	11	22	0	0
Early dose warning	2	4	11	58
No drug order	4	8	8	42
Other	2	4	0	0

^a BCMA, bar-code medication administration system.

Errors Caused by or Associated with BCMA Technology

There were 445 reports where the error was either directly caused by or indirectly associated with BCMA technology (Table 2). These errors involved failures with the BCMA process such as mislabeling (e.g., the bar

code label was affixed to the wrong strength of the correct drug), lack of a bar code on the product, inability to scan a bar code, overrides, and work-arounds.

Of the 445 errors, 284 (64%) did not reach the patient and represented potential errors and errors that were intercepted by hospital staff (Categories A and B). There were 160 (36%) errors that did reach the patient but did not result in harm (Categories C and D). One error resulted in temporary patient harm (Category E), but there were no reported errors that caused prolonged hospitalization, permanent harm, or death (Categories F through I). Of the 146 potential (Category A) errors, three quarters involved medications without bar codes or medications with bar codes that could not be machine read ($n = 108$). Medication use processes most often implicated in BCMA error events included dispensing (51%), administering (31%), transcribing (17%) and prescribing (1%). A majority of mislabeling errors (73%) did not reach the patient. Many of these errors were caused by attaching a bar code associated with one product to a different product.

Twenty-three (5%) of the 445 errors occurred because providers ignored BCMA-generated warnings, and 34 (8%) error reports revealed that bar codes were available on the medication but were not scanned. Nearly all of these errors reached the patient. Workarounds (the use of BCMA in ways that circumvent its safety advantages) by nursing and pharmacy personnel accounted for 43 (about 10%) of all BCMA-related error reports. The most frequently reported nursing work-arounds included scanning the patient's identification from the chart (rather than the patient's wristband) and scanning medications at the nurses' station in preparation for passing medications.

Table 2. Types of Errors Associated with BCMA Technology by Error Severity ^a

Errors Associated with BCMA Technology	Potential and Intercepted (Categories A and B)		Nonharmful (Categories C and D)		Harmful (Category E)		Total (All Categories)
	n	%	n	%	n	%	n
Mislabeling of medication with incorrect bar code	94	73	34	27	0	0	128
Lack of bar code	105	90	12	10	0	0	117
Inability to scan bar code	47	90	5	10	0	0	52

Override of error warning	2	9	20	87	1	4	23
Bar code not scanned	0	0	34	100	0	0	34
Workarounds	0	0	43	100	0	0	43
Wrong patient	2	29	5	71	0	0	7
System not available	0	0	4	80	0	0	5
Miscellaneous	34	92	3	8	0	0	37
Total	284	64	160	36	1	<0.1	445

^a BCMA, bar-code medication administration system. No Category F, G, H or I errors were reported. All percentages have been rounded.

The analysis of medication error data related to BCMA technology documents that this technology can serve as an important tool in preventing medications errors. The data further show that BCMA technology provides an additional safety net at the patient’s bedside during the administration phase of the medication use process. This can be particularly important because there are few opportunities to intercept errors at this point of care where the caregiver, patient and product interface. The data further indicate that once an error has reached the administration phase, it is less likely to be intercepted before reaching the patient as compared to other medication use phases.⁴

Case Examples ^b

1. A nurse reported that a trimethobenzamide suppository had been stocked in an automated dispensing device (ADD) drawer intended for the storage of a bisacodyl suppository. The error was caught by a scan of the package bar code and the administration of the wrong drug to the wrong patient was avoided.
2. A nurse attempting to administer a levofloxacin dose scanned the drug at the patient’s bedside and received a “no order in system” warning message. Upon review, the warning confirmed that the drug was not intended for that patient.
3. The pharmacy prepared an intravenous (IV) piggy back containing ampicillin 3 gm and sent to the nursing unit. As the nurse prepared to administer the medication, the bar-code system indicated that the product was gentamycin. Upon further investigation, it was discovered that two bar-code labels were affixed to the piggy-back container. The product was returned to the pharmacy where the discrepancy was resolved.

4. A physician prescribed an estradiol 0.1 mg/day weekly patch, however, the pharmacy dispensed estradiol 0.1 mg/day biweekly patch. When the nurse was applying the patch to the patient, the package was scanned and BCMA generated an error warning, “Medication order not found.” The nurse overrode the warning, applied the patch, and documented the administration in the chart.

5. A nurse intended to administer an IV infusion of pantoprazole, but she failed to scan the solution bag and unintentionally initiated an infusion containing insulin, which was completed during a 30-minute period. As a result of the error, the patient underwent serial blood glucose monitoring every 15 minutes and an infusion of dextrose 50%. Upon further review, it was determined that neither the patient’s ID wristband nor the bar code labeled infusion bag had been scanned.

Recommendations to Prevent BCMA Technology System Errors:

- Unit of use medications that contain the manufacturer’s bar codes should be procured to the greatest extent possible.
- Double check all bar-code generated labels affixed to compounded injectable medications before the product leaves the pharmacy.
- Monitor and analyze all BCMA override reports. Address system workarounds through process change and staff education.
- False-positive warnings should be minimized in order to reduce the likelihood that staff will ignore warnings for real errors.
- Ensure that an urgent need exists for all “stat” orders as pharmacy review and advantages of BCMA can become circumvented with misuse of “emergency orders”.
- Develop BCMA policies that can be easily implemented when products fail to scan. Processes in the pharmacy will likely be different than processes at the point of care.

^a. This story is an adaptation of an article published in the *Joint Commission Journal on Quality and Patient Safety*, May, 2007 Vol 33 No.5 pg 293-301.

^b Case reports reflect actual error descriptions but may have been modified for clarity .

References:

1. Grotting J.B., et al.: *The Effect of Barcode-Enabled Point-of-Care Technology on Patient Safety: Literature Review by Bridge Medical, Inc., October 2002.* http://www.bridgemedical.com/pdf/whitepaper_barcode.pdf (last accessed Mar. 6, 2007).
2. American Hospital Association, Health Research & Educational Trust, and the Institute for Safe Medication Practices: *Pathways for Medication Safety: Assessing Bedside Bar-Coding Readiness.* <http://www.ismp.org/selfassessments/PathwaySection3.pdf> (last accessed Mar. 6, 2007).
3. Pedersen C.A., Schneider P.J., Scheckelhoff D.J.: ASHP national survey of pharmacy practice in hospital settings: dispensing and administration. *Am J Health Syst Pharm* 63:327–345, Feb. 15, 2006.
4. Hicks R.W., Cousins D.D., Williams R.L.: *Summary of Information Submitted to MEDMARX in the Year 2002.*



1. USP Webinars: Examining Errors in the Perioperative Setting

USP will be hosting two Webinars in June to discuss data findings on medication errors reported in the preoperative area, operating room, and post anesthesia care unit. Expert faculty speakers will relate the data findings to a series of recommendations designed to improve medication safety in these areas.

These 90-minute Webinars will:

- Highlight key data findings reported to USP's MEDMARX program
- Offer insights into the severity, types, and causes of medication errors that occur in these specialty clinical areas
- Provide a series of recommendations to help hospitals and health systems improve medication safety in the perioperative environment
- Provide a forum to pose questions about error events and possible systems' solutions to improving patient safety

Cost: \$149/connection (Note; you may have multiple people participate at a single location/conference room)

DATES and TIMES for Evening Sessions:

Tuesday June 19 7:00pm – 8:30pm (EST): Examining Medication Errors in the Operating Room [Rodney W. Hicks, PhD, ARNP and Linda J. Wanzer, MSN, RN, CNOR] Nursing continuing education units: (provided by AORN)

REGISTRATION INFORMATION: To register via Web:
<http://www.usp.org/eventsEducation/education/pe/AORNwebinar.html>

Register via Phone: USP Customer Service at 1-800-227-8772

Wednesday June 20 7:30pm- 9:00pm (EST): Examining Medication Errors in the Perianesthesia Setting [Rodney W. Hicks, PhD, ARNP and Linda Wilson, PhD, RN, CPAN] Nursing continuing education units: (provided by ASPAN)

To register via Web:
<http://www.usp.org/eventsEducation/education/pe/ASPANwebinar.html>

To Register via Phone: Call USP Customer Service at 1-800-227-8772

WHO SHOULD PARTICIPATE: Nurses, physicians, pharmacists, medication safety officers, patient safety officers, quality improvement staff, and risk managers.

2. Joint Commission Rescinds Interim Rule on MM.4.10

The Joint Commission has rescinded the interim rule on Medication Management standard 4.10, element of performance 1 (MM.4.10, EP 1). The change means that a prospective pharmacy review is expected for all medication orders unless a licensed independent practitioner controls the ordering, preparation, and administration of the medication; or in urgent situations when the resulting delay would harm the patient, including situations in which the patient experiences a sudden change in clinical status. For full story and complete information [click here](#).

3. FDA Begins Audio Broadcasts on Emerging Drug Safety Information

The U.S. Food and Drug Administration (FDA) has begun to inform health care professionals and consumers about the availability of audio broadcasts that provide emerging drug safety information. The broadcasts, commonly known as podcasts, can be transmitted to personal computers and personal audio players. This new service provides a venue for health care professionals and patients to obtain drug safety information more effectively as alternatives to going to the FDA's Web site or reading about the information in the newspaper. For FDA Announcement, go to <http://www.fda.gov/bbs/topics/NEWS/2007/NEW01614.html>

4. Boston Hospitals Reveal Accreditation Survey Results

Five Boston-area hospitals have released Joint Commission survey results, or a summary of those results, to the public, according to The Boston Globe. The hospitals, which include Massachusetts General Hospital, Children's Hospital, Dana-Farber Medical Center, Beth Israel Deaconess Medical Center, and Brigham and Women's Hospital provided inspection information to the public. One of the most common problems found at three of the local hospitals and according to reports from the Joint Commission at about 1 in 3 nationwide is failing to ask some patients being admitted to list their medications. Medication Reconciliation was a recurring problem among the five hospitals, along with hand hygiene, time out before medical procedures, and reporting critical test results. For full text article [click here](#).

5. Smart Pumps Are Not Independently Smart

Smart infusion pumps with dose-checking technology are available to help avert potentially harmful errors associated with inappropriate drug doses.

A primary role of the smart pump is to "remember" the large number of "rules" (hospital-defined dosing limits and other clinical advisories) entered into the drug library, and to apply those rules" during pump programming to warn clinicians about potential unsafe drug therapy.

Compliance with the technology must be monitored and any barriers that are identified should be removed. There is little doubt that smart pumps can save lives if properly designed and properly used. For additional information see:

<http://www.ismp.org/Newsletters/acutecare/articles/20070419.asp>

6. New Adverse-Event Reporting Guidelines Issued for Researchers

On April 9, 2007, the FDA issued new draft guidelines specifically for the research community related to adverse-event reporting with the objective of ensuring investigational review boards (IRBs) receive the appropriate level of detail about the drug protocol under consideration to facilitate a thorough analysis of unanticipated problems.

<http://www.fda.gov/cber/gdlns/advreport.pdf>

7. WHO Releases Nine Life-saving Patient Safety Solutions

The World Health Organization (WHO) Collaborating Centre for Patient Safety has recently released Nine solutions designed to prevent health care errors that harm millions of people daily around the world. Included among the solution recommendations are: look-alike, sound-alike medication names; control of concentrated electrolyte solutions and medication accuracy. The solutions are intended to guide care processes in preventing errors from reaching patients. For more information go to www.jointcommissioninternational.org/solutions.

Based on error reports submitted to USP, a list of problematic look-alike/sound-alike drug name pairs was compiled and is available at: [Click here](#).

8. ISMP- USP Workshop: Using Data Effectively to Manage the Risks to Medication Safety

This one-day interactive program is designed for pharmacy directors, risk managers, patient safety officers, medication safety officers, and other

healthcare professionals seeking to enhance their ability to collect, analyze, and prioritize medication error and other adverse drug event data. Participants will learn how to select effective risk reduction strategies based on proven medication safety principles, instead of relying on human vigilance alone. They also will learn the best way to report findings in an actionable format that will help drive medication safety efforts and show results from system improvements. The workshops include take-home materials to analyze and prioritize medication error information and will include breakout sessions with an opportunity to gain hands-on practice working with data. Pharmacy and Nursing CE credit will be available.

AGENDA TOPICS that will be covered during the program include:

- Risk identification: Data collection methods
- Risk analysis: Analysis of aggregate data for trending
- Risk control: Choosing effective error reduction strategies
- Case studies: Examining data, priority setting, and interventions

FEES AND REGISTRATION

Early registration: \$350.00 (up to 21 days before program date)

Regular registration: \$395.00

Group discounts: For more information and a group code number for online registration, call 301-816-8136

Registrations for the workshops will be accepted starting June 1.

Visit www.intellor.com/usp/ismp/

WORKSHOP DATES

September 25, 2007

8:00 a.m.–4:30 p.m.

Hyatt Regency Tampa

Tampa, FL

October 9, 2007

Before the ASHRM Annual Conference

10:00 a.m.–5:30 p.m.

Hyatt Regency Chicago

Chicago, IL

November 5, 2007

8:00 a.m.–4:30 p.m.

USP Headquarters

Rockville, MD

December 1, 2007

Before the ASHP Midyear

8:00 a.m.–4:30 p.m.

Imperial Palace Hotel

Las Vegas, NV

9. ISMP Issues Recommendations to Decrease Heparin and Insulin Errors

The Institute for Safe Medication Practices (ISMP) has received numerous reports documenting the mix-up between heparin and insulin to include a recent report from New Jersey of the partial infusion to a premature baby of a total parenteral nutrition (TPN) bag containing insulin instead of heparin. The most common factors associated with these mix-ups appear to be similar packaging of insulin and heparin in 10 mL vials, and incorrect / dangerous placement of insulin and heparin vials on the nursing unit or in the pharmacy. Additionally, mental slips lead to confusion between heparin and insulin, as both drugs are dosed in units. For detailed information and recommendations to reduce the risk of mix-ups between heparin and insulin, go to

<http://www.ismp.org/Newsletters/acutecare/articles/20070503.asp>

USP Medication Error Reporting Programs:



MEDMARX[®]—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.
- **Medication Safety Pocket Reference**—a pocket-sized reference booklet containing listings of similar drug names and dangerous abbreviations that could cause medication errors. Contact custsvc@usp.org and ask for item #3227702.
- **Similar Drug Names Poster**—a wall poster for easy reference listing look-alike and sound-alike drug names known to cause confusion and potential medication errors when handwritten or communicated verbally. Posters are packaged in quantities of 1 (item # 3728251) 10 (item # 3728252) and 50 (item # 3728253). Contact custsvc@usp.org and ask for the appropriate item number.

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