



# Pittsburgh Regional Healthcare Initiative

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**UPMC Presbyterian**

## Bar code medication administration enhances patient safety

**Guest columnist, Robert J. Weber, MS, FASHP.**

The goal of the University of Pittsburgh Medical Center (UPMC) in medication patient safety is to eliminate medication errors through the systematic reporting, analysis, and sharing of medication error information and problem solving strategies within and across health-system hospitals. Through the support of

### **Point of care systems and UPMC's safety plan**

Implementing a bar code medication administration system is part of UPMC's patient safety plan (Figure 1), which includes automation as a way to improve safety. Currently, UPMC uses Robot-Rx® and AcuDose-Rx®

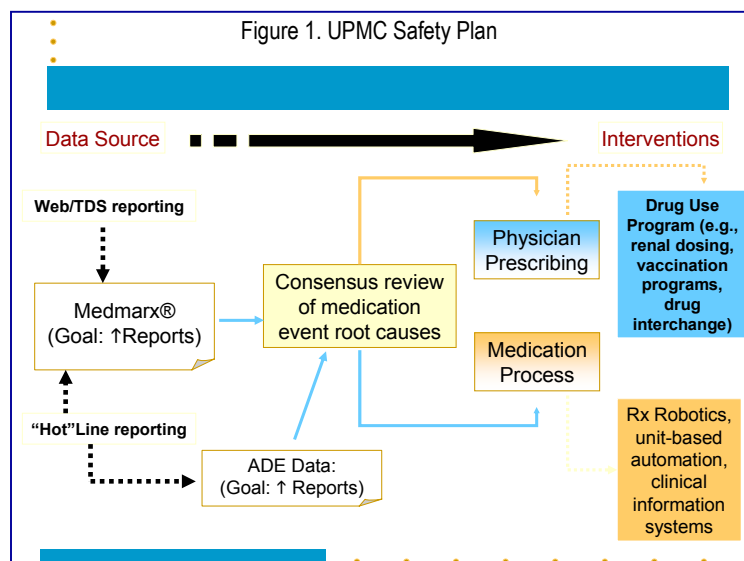
dispensing systems to reduce errors and improve pharmacy efficiency. But bar code medication scanning systems, recommended by the Institute of Medicine (IOM), reduce the chance of error at the point of care, before the wrong medicine can reach the patient. The Food and Drug Administration (FDA) also requires all manufacturers to supply universal readable bar codes on their products by early 2006.

### **Safety Potential Using Bar Code Medication Administration in Relation to National Medication**

### **Error Trends and UPMC Presbyterian Errors**

We demonstrated just how bar code medication administration can improve safety by analyzing errors reported through the national MEDMARX database and predicting which of these errors could be prevented by using the system. Since error reporting is voluntary, it is difficult to determine the true safety value of bar code medication administration. However, we used national

Figure 1. UPMC Safety Plan



senior leadership and the efforts of our staff and industry partners, UPMC Presbyterian implemented bar code medication administration in May 2005. Bar code medication administration promotes safety by intercepting and preventing medication administration errors; improves medication administration processes by preventing duplicate work; and allows for an electronic medication administration record (eMAR).

MEDMARX data to establish a range of prevented errors, then validated the information with our system experts to determine a potential impact of bar code medication administration.

MEDMARX reports medication errors for each level of the NCC MERP\* Category Index. This index indicates both severity and outcome of reported medication errors, from the “near miss” to the “sentinel event.”

- Category “A” and “B”: Did not reach a patient and/or are circumstances or events that have the capacity to cause errors.
- Category “C” and “D”: Reached a patient but did not result in harm.
- Category “E” and “F”: Resulted in harm that was resolved after treatment.
- Category “G” through “I”: Resulted in permanent harm and even death.

Examining Category “E” through “I” Errors reveals the safety benefit of bar code medication administration

We chose to review Category “E” through “I” errors reported to the National MEDMARX Database and the Pittsburgh Regional Healthcare Initiative (PRHI) from June 1, 2002 through February 28, 2003, since these errors most likely serve as a threat to patient safety. Figure 2 represents the drug classes involved in serious errors for both the region and the nation. These trends are consistent with the reports throughout the medication error literature as well as those identified by the Institute for Safe Medication Practices.

MEDMARX data also showed us where in the medication process the serious errors occurred, (Figure 3). Administration errors can include an omitted dose, wrong timing of administration, or administration of a

wrong dose or drug to a patient.

We further identified those drugs associated with administration errors where using a bar code medication administration system would have prevented the error both across the nation and the region (Figure 4).

### ***Positive patient identification (PPID) improves medication safety***

PPID makes medication ordering more efficient and safer.

Bar code medication administration has made our medication processes at UPMC more efficient by eliminating duplicate work and reducing the risk of errors. For example, UPMC Presbyterian staff were using hand-written medication administration records on the medical-surgical units; Emtex® electronic medication orders in the ICU; and the Electronic Health Record’s PharmNet® system in the pharmacy. Nurses, health unit coordinators (HUCs) and pharmacists had to enter the same order for a single patient. UPMC’s bar code medication administration system eliminates this duplication of work and attendant opportunity for error, and provides for an electronic MAR for the medical-surgical units.

Bar code medication administration has reduced medication errors by making sure the right medication gets to the right patient. Double-checking of patient identification every time medication is administered, or “Positive Patient Identification (PPID)”, is an important feature of the bar code medication administration system. Figure 5 describes the “before and after” effects of PPID.

### ***Sharing what we learned***

We have learned lessons that may be of value to others interested in using this technology. We found

this system to be valuable in standardizing medication administration processes that improve medication safety. To implement such a system, organizations should focus on the following:

- Establishing support from leadership and at all levels of the organization for bar code medication administration to incorporate bar coding systems as part of the organization’s safety plan;
- Designing a multidisciplinary process for selecting a bar code system;
- Installing the computing infrastructure to support bar coding;
- Establishing an inventory control system that assures for nearly 100% bar coding of medications;
- Revising pharmacy and nursing medication processes to enhance functionality and
- Developing quality indicators for bar coding systems.

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**Figure 2. Drug Classes Involved in “E” – “I” Errors**

National MEDMARX Reporting		PRHI MEDMARX Reporting	
Drug Class	% E-I errors	Drug Class	% E-I errors
Opioids	13.4%	Opioids	20.5%
Anticoagulants	10%	Glycemic agents	11%
Glycemic agents	8.1%	Antibiotics	7.8%
Electrolytes	3.0%	Anticoagulants	5.7%

**Figure 3. Steps in Medication Process Where Errors Occurred**

Process Step	PRHI Reports	National Reports
Prescribing	4.5%	16.7%
Dispensing	10.1%	20.7%
Administering	50.6%	35.7%
Documentation	13.8%	24.6%
Monitoring Medication Effects	4.4%	2.3%

**Figure 4. Selected Drug Products (Incidence) Associated with Serious Administration Errors Nationally, June 2002 – Feb 2003**

Morphine (76)	Diltiazem (14)
Warfarin (52)	Glipizide (10)
Oxycodone (20)	Glyburide, glemipiride, metformin (20)
Metoprolol (20)	Clonazepam (6)
Digoxin (16)	Clopidogrel (9)
Ciprofloxacin, levofloxacin (20)	Trazodone, zolpidem (8)
Citalopram (5)	Enalapril, captopril, lisinopril (14)

**Figure 5. Impact of PPID feature of Bar Code Medication Administration**

Metric	Before PPID	After PPID
Nurse satisfaction with the safety of the medication system	42%	78%
Unauthorized drug errors	5 per 1000 doses administered	2 per 1000 doses administered
Compliance with patient identification process	27%	100%
Intercepted medication errors	0 per day	1-2 per day

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