BPOC/eMAR spotlight on performance improvement

ABSTRACT

The implementation of an electronic medication administration record (eMAR) and utilization barcode point of care technology (BPOC) in the medication administration process can dramatically improve patient safety and prevent the wrong medication from being administered to a patient. While the realization of this technology in our health-system has prevented countless medication errors, we continue to experience errors that should be prevented by using BPOC. This article outlines how we have trended medication errors and developed performance improvement activities to improve patient safety following the implementation of BPOC.

Article by **Noel Hodges**

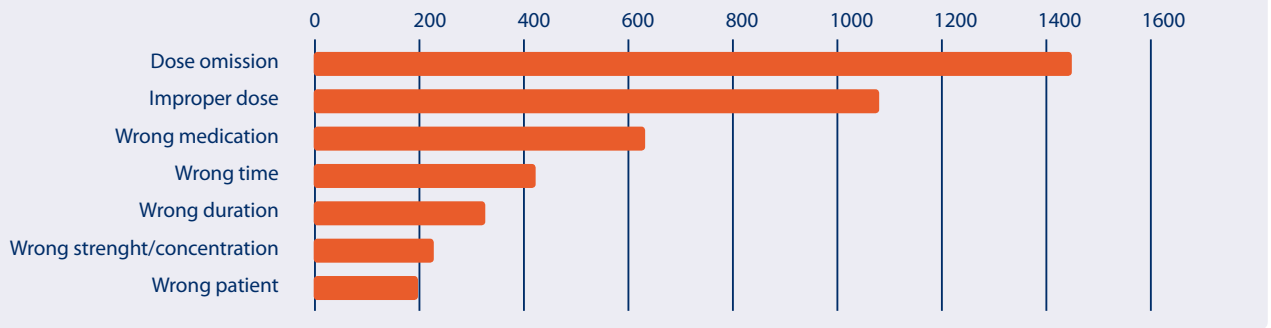
Implementing eMAR at HCA

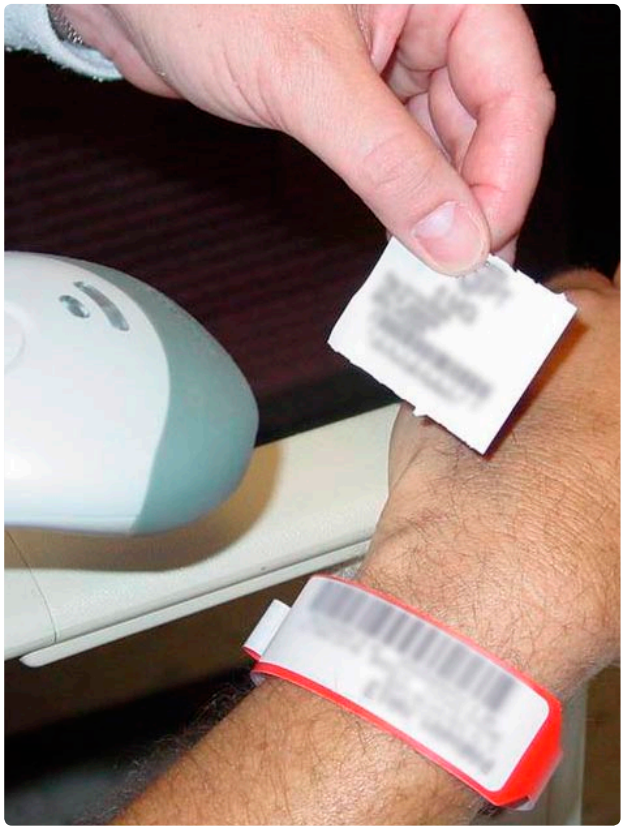
In early 2002, the Hospital Corporation of America (HCA) began a pilot to implement an electronic medication administration record (eMAR) and to utilize barcode point of care technology (BPOC) for medication administration in approximately 171 of their acute care hospitals in the United States.

In 2003, HCA started this initiative in their Richmond Market, consisting of six acute care hospitals supporting 1620 operating beds in Richmond, Virginia (USA). A major reason for implementing eMAR was to enable the healthcare provider to administer medications with confirmation of the Five Rights of medication administration: right patient, right dose, right route, right time, and right medication. Secondarily, the organization wanted to create a more complete electronic documentation system without compromising the functionality of the existing paper MAR. Today our eMAR is being used to display the patient's current active medication list; and a bar-coded, unit-of-use medication is scanned prior to administration to the patient (BPOC).

HCA's longstanding relationship with Medical Information Technology, Inc. (MediTech), their hospital information system, made implementing their eMAR and BPOC system extremely easy. The system integration allowed nursing and pharmacy to communicate in real time and improve patient safety. The systems also provided data and information that was never captured before, including medication errors.

Figure1: 2006 Medication Events by Event Code





In 2007, medication event data began to be reviewed from our 2006 data in aggregate from each of our facilities. Notability, we were still experiencing "wrong patient" and "wrong medication" events (Figure 1). It was our original hope that by using eMAR and BPOC, which required every patient and every dose to be scanned, that wrong patient and wrong medication errors would become never-events.

Within our health-system, our average patient scan rate was 96.58% and our average medication scan rate was 96.10%. Based on 11,862, 865 doses administered in 2006, approximately 462,000 doses were given outside or bypassed our system checks. These startling discoveries lead us back to HCA's original patient safety goals (Figure2). We needed to use the data that was collected to improve our medication administration process and enhance our technology to make it easy to do the right thing and harder to do the wrong thing.

Medication doses given without using BPOC demonstrated a gap in our process that resulted in a greater opportunity for a potential error. In addition, we also experience medication events when the system was used as designed or partially used. We recognized our focus must be on tracking and trending both of these variations.

Figure 2: HCA's Patient Safety Goals

- Establish patient safety and a visible commitment to "putting patient first" philosophy
- Move from blaming people to improving processes
- Improve use of technology to prevent and detect error
- Use data to identify and measure improvements

Post eMAR Implementation: Reporting and Monitoring of Medication Events

To improve patient safety utilizing eMAR and BPOC within the hospital environment, medication errors must be identified, reported, reviewed and properly categorized. Only after each of these steps has taken place, can the data be analyzed and used to develop a performance improvement process. The purpose of this project was to provide hospitals a standard taxonomy that could be used in classifying the specific cause of each medication error reported. This standardization would assemble data that could trend specific error causes within a health system and present opportunities for improving the medication use process.

Within our health-system, the medication error reporting tool in MediTech was modified to include a standard taxonomy for documenting the specific cause of each medication error. This taxonomy focused on event codes, such as wrong patient or wrong medication, it then further classified errors by a general cause such as communication or staff competency. The final stratification was identifying the specific cause, like illegible handwriting or miscalculation of dose. Our taxonomy was adapted from The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP)[1] and modified to include specific cause codes relative to BPOC such as "medication barcode will not scan", "patient armband will not scan", "wrong medication packaged or bar-coded"…etc. These specially created cause codes gave us the ability to track and trend medication errors related to our bed-side technology.

A multidisciplinary team of pharmacy directors, risk managers, and quality management staff reviewed the

1 http://www.nccmerp.org/pdf/taxo2001-07-31.pdf

Figure 3

EvCode	ORDER ENTRY ERROR	ACK INCORRECT/OMITTED	MISCALCULATION OF DOSE/RATE	DISPENSING ERROR	CHART CHECK PER HOSP POLICY	PRESCRIBING ERROR	ORDER INTERPRETATION	COMMUNICATE BETWEEN CLINICIANS	COMPETENCY/NOT TRAINED	DUTIES NOT PERFORMED	ORDER MISSED	P&P NOT FOLLOWED	INATTENTION	PHARMACY CENTRAL ORDER ENTRY	ORDER EXECUTION	ILLEGIBLE HANDWRITING	EQUIP PROGRAMMED/SETUP WRONG	OTHER	COMMUNICATION BETWEEN CLINICIA
Improper dose	185	115	47	15	19	21	20	17	18	19	17	17	16	18	14	9	8	8	10
Wrong dose form	31	14	3	9	2	2	2	3	1		1	1	2		2	4	1	2	1
Wrong strenght/ concentration	50	27	7	19	7	3	3	4	2	2	3	3	2	1		2	3	2	
Grand total	266	156	57	43	28	26	25	24	21	21	21	21	20	19	16	15	12	12	11

specific causes assigned to each general cause. Once the list was finalized, staff education was done to ensure the coded of errors was consistent in each facility. A recommended team of pharmacy, nursing, risk and quality professionals within each facility was charged with reviewing each error and applying the correct error cause codes. This process was done weekly in many of our facilities to ensure medication events were analyzed in a timely manor.

Error tracking based on specific cause codes was provided to each facility on a monthly basis while trends throughout the health system were reviewed and performance improvement processes were implemented. By using this taxonomy medication errors can be tracked and trended within each institution and provide a system-wide approach to establishing safe medication practices in all facilities. For example in Figure 3, we found the most common cause or a patient to receive the wrong dose of medication (improper dose, wrong form, or wrong strength / concentration) was due to pharmacist order entry errors. But we also found mathematical calculations, physician prescribing and communications also contributed to these types of errors.

At a corporate level, a small team of pharmacy, quality and nursing professionals then developed training tools and system changes to assist individuals at each facility on reporting and categorizing medication errors. This team also provided leadership for medication error reduction and process change, monitor data integrity, interpret data with trending analysis, and identify systems breakdown. This group focused on performance improvement activities that could be implemented in our hospitals to prevent future medication errors.

Post eMAR Implementation: Performance Improvement Activities

By analyzing our medication event data and through direct observation of the medication administration process we have identified several key areas for performance improvement: only medications with viable barcodes reach the patient, all medication should be scanned before administration, and scanning all pills required for a complete dose.

It was imperative as part of the pharmacy process to ensure each unit-dose or unit-of-use medication reach the patient with a viable bar-code. During the drug procurement process, our pharmacies tried to source only bar-coded medications. This strategy was supported by our contracting department in selecting pharmaceutical manufactures that bar-coded their products. Our purchasing process required the scanning every medication received in our pharmacies. For those medications without bar-codes or

those medications where the bar-codes would not scan, pharmacy would quarantine those products until a bar-code could be applied.

During direct observation many medications were either not scanned or scanned after the medication administration process. Several factors contributed to these work-a- rounds, but on of the most common reasons given by nursing staff was the reliability of the medication bar-codes. If an individual medication package failed to scan correctly, the nurse was required to wait for the pharmacy to resolve the issue or replace the package. We found some nurses would save an empty package they knew would scan as a back-up and therefore not having to wait for pharmacy to resolve the error.

Many of our medications require multiple tablets to equal the prescribed dosage. For example, an order for acetaminophen 650mg required two 325mg tablets. We experienced incidents where only one table was scanned or the same package was scanned twice to complete the administration of this order. In both of these cases where only part of the dose was scanned, patient safety checks are bypassed.

These and other "short-cuts" or "work-a-rounds" start with the pharmacy ensuring proper, viable bar-codes. This important quality assurance process begins in the pharmacy and must be done for every medication procured and ultimately dispensed for patient administration.

Conclusion

In conclusion BPOC is one of the most important technologies we can use in our hospitals to improve patient safety. Bar-code technology is used in virtually every industry and for multiple applications. Health-care must implement and maximize the patient safety benefits from BPOC.

AUTHOR

Noel Hodges is a licensed pharmacist in the Commonwealth of Virginia. As the Director of Pharmacy Services for HCA Central Atlantic Supply Chain, he is responsible for facility supply chain pharmacy operations and to identify and execute continuous improvement opportunities. Hodges completed his pharmacy degree at Purdue University and his Master of Business Administration from Strayer University. Hodges led the pharmacy implementation of Electronic Medication Administration Records (eMAR) and Bed-side Point of Care (BPOC) for the HCA Richmond Division, and provides continuous monitoring of bedside scanning compliance and patient safety. He was also responsible for developing a centralized bar-code packing operation for his health-system. He has authored multiple articles and presented posters at American Society of Health-System Pharmacists meetings and The National Patient Safety Foundation on the topic of eMAR and BPOC. He has spoken locally, nationally and inter-nationally on bed-side scanning system, drug packaging, and BPOC.