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Patient Safety Tip of the Week

September 28, 2021

Barcoding Better? Not So Fast!

Barcoding, for bedside medication verification and other uses, has arguably been our most effective medication safety intervention. Yet barcoding has always had a bumpy road. One of our earliest patient safety columns discussed the many workarounds that were being used during barcoding (see our June 17, 2008 Patient Safety Tip of the Week "Technology Workarounds Defeat Safety Intent"). Our very first observation of a nurse administering medications as we implemented our first barcoding system was eye opening. The label on the medication was smudged so the nurse simply copied and pasted the medication label from the CPOE system, totally bypassing the safety built into the barcoding system. In that column we discussed, among other studies, the seminal study by Koppel and colleagues (Koppel 2008) that identified 15 types of workarounds and 31 types of causes for the workarounds in barcoding medication administration systems.

So, how is barcoding going? Have we worked out all the kinks? A recent observational study found that issues related to barcode medication administration (BCMA) remain rampant. Mulac et al. (Mulac 2021) used a mixed-methods design comprising structured observation, field notes, and nurses' comments on use of BCMA use at two medical wards at a 700-bed hospital in Norway. They observed 44 nurses administering 884 medications to 213 patients and identified BCMA policy deviations for more than half of the observations.

They observed task-related policy deviations in 140 patients (66%) during dispensing and 152 patients (71%) during administration. Organizational deviations included failure to scan 29% of medications and 20% of patient's wristbands. Policy deviations also arose due to technological factors (eg, low laptop battery, system freezing), as well as environmental factors (eg, medication room location, patient drawer size). Most deviations were caused by policies that interfere with proper and safe BCMA use and suboptimal technology design.

Policy deviations were observed fairly frequently during the dispensing process. These included:

- Medication not dispensed
- Wrong dose dispensed
- Scanning failures

- Barcode label missing or not attached
- Wrong medication dispensed
- Errors due to recent changes in the eMAR
- Medications placed in the wrong compartment in a drawer
- Wrong room number on a patient drawer
- Wrong label attached
- Patients' own medication (brought from home) stored in the patient room

That last item is one we suspect happens in other hospitals. The facility policy was that the patients' own medication should be stored in the COW (computer on wheels) or the medication room, yet they found a 96% deviation rate from this policy. It's rare that a patient needs to use his/her own medication brought from home. But, occasionally, a hospital formulary may not have a certain medication required by the patient and use of the patient's own supply is necessary. But it is critical in such cases that those medications be handled and barcoded just as you'd barcode medications in your hospital pharmacy. And they should be stored in either the pharmacy or in the patient's drawer in the COW (or other medication cabinet) rather than elsewhere in the patient's room. There are other potential problems with patients' own medications. In our September 2021 What's New in the Patient Safety World column "Another Unusual Cause for a 10-Fold Overdose" we described a case where a 10-fold dosing error was made during the transition from use of the home medication to use of the pharmacy's formulary product.

Technology-related factors were found in 18% of observations. These included:

- Low laptop battery
- System freezing
- Malfunctioning barcode scanner
- Barcode scanner unavailable

Software problems included slow response and the need for multiple clicking after scanning each medication.

Environmental factors included both facility layout and equipment issues, such as:

- Medication rooms located some distance from the nursing stations and patient rooms (so nurses had to run back and forth to the medication room multiple times during an administration round to rectify deviations in the COW)
- Patient drawers were too small and could not contain all the patient medications
- Work surface of the COW's often untidy and contained single-dose units from past administrations or falsely dispensed medications

Nurse-related factors also led to deviations:

- Several nurses admitted that they did not use the barcode scanning equipment on a daily basis
- If the ward was particularly busy, nurses tended to discard BCMA because they perceived it slowed down the medication administration

Most importantly, as our many columns dealing with workarounds have noted, every time you see a workaround you need to look for the root cause(s) that led to that workaround. The Mulac study did delve into those root causes.

The "big picture" causes to policy deviations are that there is a complex dispensing process, the BCMA procedure can be slow or cumbersome, technology design is often suboptimal. and policy description is often non-specific.

Hardware and connectivity problems were common causes. Sometimes laptops were not charged. Scanners often had to be borrowed across wards and some of the scanners were not wireless. And that the scanner was not mobile but attached to the laptop further restricted their use. The authors felt these factors might explain why 20% of patient ID wristbands were not scanned during observation.

Interestingly, the COW (computer on wheels) shows up in several places where causes are discussed. The lack of standardized delivery of dispensed doses lead to several variations in how the medications were dispensed in the COW. As a result, the nurses found it difficult to take for granted that the medications dispensed were correct. To compensate for the uncertainty, the nurses had to manually reconfirm doses before administering to patients. This practice undermines the purpose of BCMA. The COW was also described as being "bulky". Because of that "bulk" nurses often avoided bringing the COW into the patient room when administering few or one single medication. When the scanner was connected to the COW, that meant the patient's wrist ID band was not scanned. The COW also contained medications for all patients, which when combined with scanning not being used increased the risk of a patient being given the wrong medication. And, in cases where medications were missing from the COW (often because the COW drawers were too small), the distance a nurse had to travel to obtain the medication was too long. The small size of patient drawers led to deviations because voluminous medications had to be retrieved during administration. And, as above, the work surfaces of the COW's were often untidy.

The Mulac study demonstrates the power of a tool we underutilize – the observational audit. We've discussed that previously in our Patient Safety Tips of the Week for March 5, 2013 "Underutilized Safety Tools: The Observational Audit" and May 18, 2010 "Real-Time Random Safety Audits". But you need to be careful in performing these that you let your staff understand this is a learning exercise and not intended to be used in any punitive way. You need to use the opportunity to ask staff why they are doing things a certain way. That is what leads you to identify root causes that you can act upon. Sometimes you even need to ask "Would you have done it that way if I were not observing?" In the Mulac study one nurse admitted to not using the BCMA on regular basis but used it during observation period. Again, that question needs to be asked in an entirely nonjudgmental manner.

Here we are – 13 years after the Koppel study that found so many workarounds during BCMA – and we are still seeing significant deviations in use of this technology that is

otherwise so valuable in ensuring medication safety. How many of you have done an audit on the BCMA process like that done by the Mulac group? We'll bet your observations probably won't be much different.

We also refer you to our January 2018 What's New in the Patient Safety World column "Can We Improve Barcoding?" that described several other studies demonstrating gaps in our use of barcoding in medication safety.

See some of our other Patient Safety Tip of the Week columns dealing with unintended consequences of technology and other healthcare IT issues:

- June 19, 2007 "Unintended Consequences of Technological Solutions"
- May 20, 2008 "CPOE Unintended Consequences – Are Wrong Patient Errors More Common?"
- June 17, 2008 "Technology Workarounds Defeat Safety Intent"
- August 26, 2008 "Pattern Recognition and CPOE"
- September 9, 2008 "Less is More….and Do You Really Need that Decimal?"
- December 16, 2008 "Joint Commission Sentinel Event Alert on Hazards of Healthcare IT"
- February 2009 "Healthcare IT The Good and The Bad"
- March 3, 2009 "Overriding Alerts…Like Surfin' the Web"
- October 2009 "A Cautious View on CPOE"
- November 24, 2009 "Another Rough Month for Healthcare IT
- April 20, 2010 "HIT's Limited Impact on Quality To Date"
- July 27, 2010 "EMR's Still Have a Long Way to Go"
- March 22, 2011 "An EMR Feature Detrimental to Teamwork and Patient Safety"
- January 24, 2012 "Patient Safety in Ambulatory Care"
- June 26, 2012 "Using Patient Photos to Reduce CPOE Errors"
- June 2012 "Leapfrog CPOE Simulation: Improvement But Still Shortfalls"
- July 17, 2012 "More on Wrong-Patient CPOE"
- January 2013 "More IT Unintended Consequences"
- April 23, 2013 "Plethora of Medication Safety Studies"
- April 30, 2013 "Photographic Identification to Prevent Errors"
- October 8, 2013 "EMR Problems in the ED"
- March 11, 2014 "We Miss the Graphic Flowchart!"
- October 2014 "Ebola Exposes Fundamental Flaw"
- January 2015 "Beneficial Effect of EMR on Patient Safety"
- March 2015 "CPOE Fails to Catch Prescribing Errors"
- March 31, 2015 "Clinical Decision Support for Pneumonia"
- August 2015 "Newborn Name Confusion"
- December 2015 "Opioid Alert Fatigue"
- January 12, 2016 "New Resources on Improving Safety of Healthcare IT"
- January 19, 2016 "Patient Identification in the Spotlight"
- February 9, 2016 "It was just a matter of time…"
- April 5, 2016 "Workarounds Overriding Safety"

- May 2016 "Name Confusion in the Pharmacy"
- May 3, 2016 "Clinical Decision Support Malfunction"
- May 24, 2016 "Texting Orders – Is It Really Safe?"
- August 23, 2016 "ISMP Canada: Automation Bias and Automation Complacency"
- November 22, 2016 "Leapfrog, Picklists, and Healthcare IT Vulnerabilities"
- January 2017 "Joint Commission Thinks Twice About Texting Orders"
- February 28, 2017 "The Copy and Paste ETTO"
- March 2017 "Yes! Another Voice for Medication e-Discontinuation!"
- April 2017 "How Much Time Do We Actually Spend on the EMR?"
- June 27, 2017 "Texting – We Told You So!"
- August 1, 2017 "Progress on Wrong Patient Orders"
- January 2018 "Can We Improve Barcoding?"
- January 16, 2018 "Just the Fax, Ma'am"
- January 30, 2018 "Texting Errors Revealed"
- June 19, 2018 "More EHR-Related Problems"
- September 2018 "More Clinical Decision Support Successes"
- December 11, 2018 "Another NMBA Accident"
- January 1, 2019 "More on Automated Dispensing Cabinet (ADC) Safety"
- February 5, 2019 "Flaws in Our Medication Safety Technologies"
- March 26, 2019 "Patient Misidentification"
- May 2019 "Too Much Time on the EMR"
- May 21, 2019 "Mixed Message on Number of Open EMR Records"
- July 23, 2019 "Order Sets Can Nudge the Right Way or the Wrong Way"
- September 10, 2019 "Joint Commission Naming Standard Leaves a Gap"
- September 24, 2019 "EHR-related Malpractice Claims"
- December 17, 2019 "Tale of Two Tylers"
- June 2020 "EMR and Medication Safety: Better But Not Yet There"
- June 16, 2020 "Tracking Technologies"
- July 2020 "Patient Requests for EHR Corrections"
- July 21, 2020 "Is This Patient Allergic to Penicillin?"
- September 2020 "More on Workarounds"
- November 17, 2020 "A Picture Is Worth a Thousand Words"
- March 2021 "ECRI Partnership Whitepaper on Alert Fatigue"
- May 11, 2021 "How Are Alerts in Ambulatory CPOE Doing?"
- July 2021 "EPIC Sepsis Prediction Tool Falls Short"

References:

Koppel R, Tosha Wetterneck T, Telles JL, Karsh B-T. Workarounds To Barcode Medication Administration Systems: Their Occurrences, Causes, And Threats To Patient Safety. JAMIA 2008; 15(4): 408-423

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Mulac A, Mathiesen L, Taxis K, et al. Barcode medication administration technology use in hospital practice: a mixed-methods observational study of policy deviations. BMJ Quality & Safety 2021; Published Online First: 20 July 2021 https://qualitysafety.bmj.com/content/early/2021/07/19/bmjqs-2021-013223

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