

2014 Gage Awards

Reference #	7471505
Status	Complete
Name of hospital or health system	The Ohio State University Wexner Medical Center
Name of project	Reducing Medication Errors in Solid Organ Transplantation Using Barcode-Assisted Medication Administration
CEO name	Dr. Steven Gabbe
CEO approval	Check here to confirm that your CEO approves of this project being submitted for a 2014 Gage Award
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Within which of the two categories does your application best align?	Quality
1. Provide a brief description of the project. (This section should resemble an abstract for a poster presentation or an abstract for a peer reviewed journal. Include an objective, data sources, study design, findings, and conclusions.)	<p>Solid organ transplant recipients are prescribed a high number of medications increasing the potential for medication errors. Barcode assisted medication administration (BCMA) is technology that reduces medication administration errors. An observational study was conducted at an academic medical center solid organ transplant unit before and after BMCA implementation. Medication accuracy was determined and administration errors were categorized by type and therapeutic class of medication. A baseline medication administration error rate of 4.8% was observed with wrong dose errors representing 78% of the errors. During the Post-BCMA period the medication administration error rate was reduced by 68% to 1.5% (p=0.0001). Wrong dose errors were reduced by 67% (p=0.001) and unauthorized medication administrations were reduced by 73%. Steroids were associated with the highest error rate. The results of this study suggest routinely adopting BCMA has the potential to reduce medication administration errors in transplant patients.</p>
1A. Attachment, if applicable (Applicable examples include a peer reviewed journal article, other content published in the literature, or a presentation at a national meeting)	BCMAinTransplantSMB.pdf (325k)

2. Describe the methods use in this project. Include where, why, and how the project was accomplished.

This study was performed on the solid organ transplant unit at OSUWMC in September/October 2011 and June 2012. OSUWMC went live with a fully integrated EMR (EPIC) on October 15th, 2011 so these observations were PRE and POST EMR implementation.

High volume medications and commonly scheduled medications are obtained from automated dispensing cabinets (ADCs) located in locked medication rooms. The medication orders dispensed from ADCs are prospectively reviewed by pharmacists prior to administration. These carts are replenished once every evening and as new orders are entered. Post transplant maintenance medications are delivered to the patient bedside as part of a patient compliance education program. Observers were trained medical and pharmacy students.

Naïve Medication Observation: Baseline (pre BCMA) nurse medication administration was observed on the transplant unit in September and October 2011. Post BCMA implementation medication administration was observed in June 2012, 9 months after the integrated electronic medical record had been implemented system-wide. Nurses were eligible for observation for the duration of the medication that day if the nurse provided consent. Trained observers shadowed nurses from medication retrieval from the ADC or medication drawer to the patient bedside for medication administration, all while being naïve to the clinicians' orders. After documentation of a medication pass for a given patient, the observer consented another nurse for observation. Medication administration observations were scheduled for the major medication passes each day across all days of the week. The majority of medication administrations occur during the morning medication pass from 0700-0930 and the evening medication pass from 1900-2130.

Observer Documentation: Observers documented the medication name, dose, route, formulation, and time of medication administration by the nurse. If a partial package of the dose was administered, the observer documented the amount administered. Large volume maintenance fluids without additives, respiratory therapy medications, and nystatin oral solution were excluded from data collection.

Medication administration error rate measurement: Medications documented during observed administrations were compared to the physician's electronic order after all observations were conducted in each time period. The name dose, route and time of the medication order were retrospectively reviewed from the patient's electronic medication record and compared to the medication order. Medication administration errors were defined as any discrepancy between the medication that was administered and the medication that was ordered. Errors were classified as wrong drug, route, and dose. Unauthorized medication administrations were also classified as an error. Errors were

	<p>discovered after medication administration and therefore observers were unable to intervene to prevent any error. The medication administration error rate was calculated as the number of medication administration errors divided by the total number of medication administrations observed in each period.</p>
<p>3. Describe the results of the project. What data was used to support improvement results?</p>	<p>The patient medical record number, medication name, dose, route and time of administration were documented during direct observation of nurses. The drug name, dose, route, and due time of the medication order was recorded from the EMR after all observations had been conducted in each time period. The primary endpoint, Pre and Post-BCMA medication administration error rate, was evaluated using Fisher's Exact Test.</p> <p>A total of 936 medication administrations were observed before the implementation of BCMA and 976 medication administrations were observed after BCMA implementation by our trained observers. Medications from the morning medication pass represented 68% of total observations before BCMA implementation and 75% of observations after BCMA implementation.</p> <p>In the baseline period, prior to BCMA implementation, 45 medication administration errors occurred (4.8% error rate), with only 15 medication administration errors discovered after the implementation of BCMA (1.5% error rate). This represents a 68% relative rate reduction in the medication administration error rate with BMCA ($p < 0.0001$). Relative error rate reductions were documented in all error types except wrong route errors. The only error type whose rate was significantly reduced was wrong dose errors with a relative rate reduction of 67% ($p = 0.001$). Unauthorized medication administrations were reduced by 72.5% ($p = 0.18$). When the drugs were broken down into categories, hormones and synthetic substitutes (corticosteroids) had a significantly greater error rate than cardiovascular (adjusted $p = 0.0001$), gastrointestinal drugs (adjusted $p = 0.01$), and blood formation and coagulation drugs (adjusted $p = 0.02$).</p>

<p>4. Describe what happened as a result of the project. Was the improvement related to the intervention? Can the project be duplicated by other organizations?</p>	<p>The implementation of BMCA reduced the rate of all medication administration error types on the OSUWMC transplant unit. We felt this was a very important finding since transplantation is a highly complex process, where a simple medication error can mean the difference between graft survival or not. The most common error observed on the transplant unit was wrong dose errors followed by unauthorized medication administrations. Considering the complexity of care issues involving transplant patients, technology was shown to improve at least one aspect of it, medication administration. With a multitude of new medications and potential associated complications, transplant patients may therefore benefit from the implementation of BCMA and reduce the potential for errors that could affect their outcome. The findings of this study were helpful for the reduction in errors to our transplant patients, but it also was very satisfying to our nursing and pharmacy staff. Often times technology can be seen as highly disruptive; in this study we were able to give real time feed back to the care teams that they had used the bar-coding technology the way it was intended- so to reduce errors. The results of this study were duplicated in our Emergency room as well where patients are often unknown and their medications multiple. We saw a similar reduction in medication errors after the implementation of BCMA. Therefore, this type of study and use of BCMA could be incorporated into any hospital contemplating the use of bar-coding for medication administration so to measure their successes and identify their opportunities.</p>
<p>5. Describe how patients, families, and if appropriate, community was included in the work.</p>	<p>Transplant patients and their families are key to the success of the transplanted graft and the patient. After transplantation, patients self administer their medications which can sometimes be more than 100 tablets a day. The use of the bar-coding technology for medication administration is explained to them immediately upon institution of self-administration of medications. We have found that the BCMA has given the patients confidence when learning the names and dosages of all the new medications. BCMA has allowed them to engage more with the careproviders and to have a sense of a safety net when most needed.</p>
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