PRACTICE APPLICATIONS
Emerging Science and Translational Applications

Breast Milk Bar Code Scanning Results in Time Savings and Staff Efficiency

PROVIDING BREAST MILK TO A hospitalized infant is generally a more complex process than breastfeeding a healthy baby. Mothers often must pump their milk so that it may be fed via tube or bottle, and the use of human milk fortifiers and other additives to increase calories or other nutrients may be necessary to meet the needs of a preterm or ill infant.[1,2] Because pumping volumes are highly individualized and may vary, preparing an individual baby's feeding may require the combination of multiple bottles of his or her mother's milk or the division of one bottle into multiple feedings. Safety concerns increase with greater manipulation.[2] Improper handling could result in contamination of feedings, which may be life-threatening for the preterm or hospitalized infant.[2] Inaccurate patient identification before combining or splitting containers may lead to a baby receiving the wrong mother's milk.[2] Mathematical calculation errors may result in improper, and possibly harmful, breast milk fortification.[2]

DECENTRALIZED VS CENTRALIZED BREAST MILK HANDLING

Typically, the mother of a hospitalized infant will pump breast milk, label the containers using patient labels provided by the facility (usually with the date and time the milk was pumped written in), and bring the milk to the hospital. Hospitals without centralized breast milk preparation often keep the milk in refrigerators or freezers on the patient units. At the scheduled feeding time, the nurse must retrieve the breast milk from the refrigerator or thaw the proper amount of frozen milk, confirm the breast milk has not expired, measure the proper volume for the feeding, and add in any ordered fortifiers. Each time the nurse prepares a feeding, care must be taken to avoid using expired breast milk, combining bottles of breast milk that are not from the same patient, adding the wrong type or amount of fortifier, or using poor food handling techniques, which could promote microbial growth.[2] Alternatively, hospitals with centralized handling typically store the labeled breast milk the mothers deliver in a centralized preparation room. Trained staff are then responsible for thawing the proper volume of breast milk, adding proper amounts of the correct fortifiers, and accurately labeling the final product to identify both the patient and the contents of the container. Centralized preparation may involve bulk preparation of a "batch" of breast milk for each individual patient; usually a 12-hour or 24-hour volume is prepared in one batch. Alternatively, a 12-hour or 24-hour batch of breast milk for an individual patient may be "unit dosed," meaning it is then portioned into individual containers for each feeding.

BREAST MILK MISADMINISTRATION

Breast milk misadministration, or the feeding of the wrong breast milk to the wrong patient, is of great concern in the hospital setting.[1,2] A two-person double check of patient name and medical record number has been used widely in health care for tasks including administration of blood, medication, and breast milk.[3-6] To prevent breast milk misadministration, a double check is needed at the time labels are provided to a pumping mother as well as during breast milk preparation/fortification, administration, and dispensing remaining milk at discharge, which could require additional staff, while still not eliminating risk of human error.[1,2] Therefore, double checks are becoming increasingly automated.[7-10]

METHODS

Breast milk handling in the Children's Hospital of Orange County centralized preparation room (known as the Nutrition Lab) was initiated in January 2013. Two dietetic technicians, registered (DTRs) were present for feeding preparation to ensure manual double checks at each step of the process. For each patient with a breast milk feeding order, the volume needed for a 12-hour period was prepared twice daily by thawing the required amount, adding any ordered fortifiers, and portioning into unit doses so that each individual feeding was in its own container. Tube feedings were portioned into syringes and oral feedings were portioned into bottles. Preparation times were 8:00 AM to 10:00 AM and 3:30 PM to 5:30 PM daily. However, because of potential needs outside designated preparation times, two DTRs were staffed during all hours of operation (6:00 AM-6:30 PM) so that two individuals would always be available to perform a double check.

A bedside double check by a registered nurse (RN) and another staff member or the parent was in place to prevent misadministration at the time of feeding. However, even with such safeguards, there was still risk of human error and the possibility that such an error would go undetected.

Consequently, to reduce the risk of error as well as staffing needs, breast milk bar-code scanning was implemented in November 2013. The bar-code scanning program (Timeless Medical

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Systems) ensured proper patient identification at each step of the process by using a patient specific bar code found on the baby's armband and breast milk labels. The system was used bedside to confirm proper identification of the correct patient by scanning the baby's armband before printing labels for pumping mothers or before scanning the label on a prepared feeding. In the Nutrition Lab, pumped milk was scanned into inventory, which allowed for tracking of the volume, location, and expiration for all milk for an individual patient. Scanning also confirmed the patient's identification before preparation, eliminating the need for a two DTR double check. Finally, the scanning system automated the process of calculating breast milk volumes and additives based on the order in the electronic medical record (EMR), and the printing of labels for the unit-dosed feedings.

Objective

To assess whether breast milk bar-code scanning would increase efficiency, a time study was conducted evaluating DTR time designated for the four primary categories of breast milk handling duties: updating and reviewing orders from the EMR, receiving milk that had been brought in by mothers and storing it in patient specific bins by order of date pumped, thawing necessary volumes for each preparation batch, and preparing individual feedings for each patient. Data were collected before scanning implementation and at two points after implementation to determine whether efficiency improved over time.

Prescanning Process

Before each batch preparation, one DTR reviewed orders from the EMR and calculated the breast milk volume needed (including a 2-mL overfill per feeding and accounting for displacement from any fortifier) along with the amount of fortifier(s). This recipe was then manually recorded on a paper tracking sheet used in the thawing and preparation steps. At the time of preparation, one DTR read aloud the full patient name and medical record number from each thawed bottle while a second DTR compared the data to the labels printed for the final product to ensure accuracy. Next, the DTR prepared the 12-hour volume and unit-dosed the feedings using the calculations on the paper tracking sheet. If the patient did not have the full amount of breast milk needed to prepare the full order, the DTR would manually recalculate the amount of fortifier based on the actual volume of breast milk available. The prepared bottles or syringes were then labeled with the DTR needing to hand write the expiration date and time on each label.

Postscanning Implementation Process

A direct interface allowed all orders placed in the EMR to automatically update in the bar code system. Total volume to thaw per 12-hour batch (accounting for the hospital's standard overfill and displacement from fortifiers), amount of fortifier(s), and volume for each feeding was automatically calculated. Prior to each batch preparation, the DTR printed a "Thaw Report" from bar code system that used the system's automated calculations to indicate volume to thaw for each patient for the current batch. Preparation began with the DTR scanning the bar code for each thawed bottle to be used to confirm identity and check for expired milk. The system then indicated the volume of breast milk to measure out, amount and type of fortifier(s) to add, and volume to place in each syringe or bottle. New bar code labels for the finished product, which included patient information, feeding order, DTR initials, and expiration date/time, then automatically printed. In the event that the amount of available breast milk was less than the amount needed, the system would automatically recalculate fortifier amounts based on the amount of breast milk available, eliminating the need for manual recalculation.

EVALUATION

A 24-day time study was conducted at three timepoints: before bar-code scanning, 3 weeks after scanning implementation, and 3 months after scanning implementation. Statistical analyses included calculation of the mean time and standard deviation for each duty as well as total time per day for each of the three timepoints. Difference in mean was used to compare each group to assess for statistical significance with regards to time differences using a confidence interval (CI) of 95%. A P value of <0.05 was considered statistically significant. All statistical tests were computed using SPSS version 14.0 (2005, SPSS).

Bar-code scanning resulted in a statistically significant reduction in Nutrition Lab staff time spent directly handling breast milk (Figure). The total time saved (approximately 1 hour per day) was reallocated for other direct patient-care duties. In addition, scanning eliminated the need to staff two DTRs at all times. By staffing with only one DTR at nonpeak times, a 20-hour per week shift was eliminated, resulting in direct yearly savings of approximately $30,000 in salary, benefits, and related costs.

It was anticipated that the time savings would be greater at the second post-implementation time study because of greater comfort with the bar-code scanning program; however, this was not the case. The fact that the time efficiency benefits were realized at 3 weeks after implementation suggested a short learning curve for proficiency of the system.

In addition to the direct time savings for the DTRs measured in the time study, scanning resulted in other noticeable improvements in efficiency. The bedside RN was able to save time by not having to locate a second RN when the parent was not available for the double check. The hospital feeds an average of 230 breast milk feedings per day. If a second RN was needed to check three of eight daily feedings, taking 30 seconds per incident, scanning would result in a time savings of approximately 263 hours per year. In addition, the interface between the bar code system and the EMR resulted in data automatically being charted upon scanning instead of the RN having to manually enter the information. Assuming 30 seconds of charting time savings per feed, this would provide an estimated time savings of approximately 700 hours per year.

The Nutrition Lab DTRs reported noticeably fewer calls from nursing staff to check breast milk inventory for their patients once the real-time breast milk inventory from the system imported to the EMR became available. Staff also reported mothers' satisfaction with being able to receive an exact inventory at any time to help avoid either running out of milk or having to

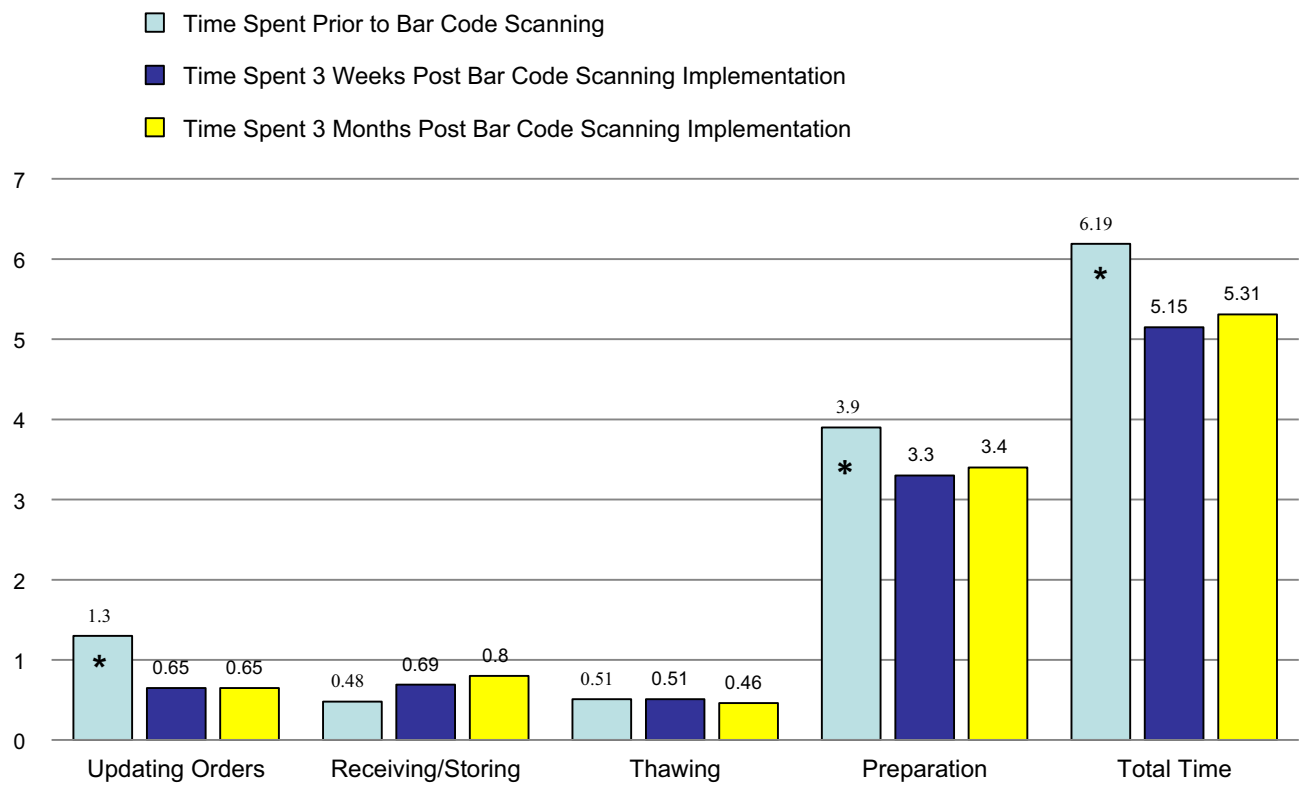

Figure. Daily total centralized breast milk preparation time and time for each duty category (displayed in hours). *Denotes statistical significance ($P<0.05$).

make a last minute extra trip home to bring more milk to the hospital.

CONCLUSIONS

The safety benefits of this performance-improvement initiative were studied and have been reported elsewhere.[11] In addition to the safety benefits associated with reducing potential errors, breast milk bar coding scanning saved time and improved efficiency. Ease of use was evidenced by time savings 3 weeks after implementation that was statistically equivalent to data from 3 months after implementation. Time savings extended beyond the 365 hours per year for direct centralized breast milk handling duties. The Nutrition Lab will save 1,052 hours per year based on not having to double staff at nonpeak times and from the reduction in calls to check breast milk inventories. In addition, an estimated savings of 963 hours per year in nursing time is anticipated based on elimination of the two-person double check and improved charting efficiency. The resulting total time savings is 2,380 hours per year for the organization, with 1,040 hours completely eliminated for a cost savings and 1,340 hours available for other patient-care duties.

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