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Executive Summary

Medication management is a vital aspect for ensuring patient safety. According to the Institute of Medicine of the National Academies in 2006, an estimated 1.5 million people are hurt from medication errors in the United States. In hospitals alone, this results in an estimated $3.5 billion in extra costs. The University of Michigan C.S. Mott Children’s Hospital ran the Medication Manager Pilot in 2006 for a new method of medication delivery which brought non-narcotic and non-refrigerated medication from the Pharmacy to patients’ bedsides in the Intensive Care Unit. The conclusion of this pilot brought results stating that the new process was beneficial to hospital staff and patient safety. As a result, the process was implemented throughout the new hospital.

Since data has not been collected concerning the bedside medication delivery process in the new hospital’s General Care Unit, there was a gap in knowledge of how the new process is affecting the jobs of the nurses and pharmacy technicians, the quality of care for the patients, and the cost of remade and wasted medications. A team of IOE 481 students was asked to evaluate the process. The overall project goal was to determine the effectiveness of the current bedside medication process by analyzing the utilization of the pharmacy technician’s time, the cost of lost or late medication, the number of locked versus unlocked medication cabinets, the number of discontinued and expired medications that were removed from rooms, and the timeliness of removing old medications from the cabinets. This report explains the method of evaluating the system, the findings and conclusions from the collected data, and recommendations.

Methods

To determine the effectiveness of the current bedside medication process, the team used surveys, time studies, statistical analysis, and cost analysis.

Nursing survey

The nursing survey was used to develop a better understanding of the process nurses follow for medication delivery and their interaction with the Pharmacy, as well as determine areas where the nurses were dissatisfied. A total of 77 surveys were collected over a one week period.

Pharmacy technician survey

The purpose of the pharmacy technician survey was to develop an understanding of the pharmacy technicians’ satisfaction with the new bedside medication delivery process in the new hospital compared to the delivery process within the old hospital. Other information gathered from the survey included details about expired or discontinued medication and how locked cabinets affect patient safety. A total of 32 surveys were collected over a one week period.
Patient Parent Survey

Parents of patients were contacted by phone or email to answer questions concerning the medication delivery process. Information was gathered about the overall satisfaction with the bedside medication delivery in the new hospital compared to the old hospital, bedside cabinet safety, and medication timeliness. A total of four parents were surveyed.

Time Studies of Pharmacy technicians

The main purpose of the time studies was to collect data on timeliness of the medication delivery process and safety of the bedside medication cabinets. Members of the team followed pharmacy technicians on their hourly run and cart run at the end of the night to time the route, collect the medication information, and record whether cabinets were locked or not.

Data Collection of Medication Removal from Bedsides

Inside of the medication cabinet, there is a green bin for good medication and a red bin that bad medication is moved to for removal by pharmacy technicians. For one week, the team had Pharmacy technicians bring back bad medications at the end of the night, keeping it separated by the colored bin they were found in. Data was collected to quantify the amount of discontinued or expired medication that was not being moved to the red bin in the bedside cabinets as well as medication information to determine the cost of wasted medication.

Data Collection by Pharmacy technicians

The team created three self-collection sheets to provide information about the main delivery method for stat medication, quantify the amount of drugs had to be remade, and to collect any reasons why medication could not be delivered.

Findings and Conclusions

From the collected data, there were several findings and conclusions. First, the surveys indicated that the nurses are satisfied and feel that the bedside cabinets add to the safety of the medication process. On the other hand, the pharmacy technicians scored their satisfaction very low and feel that the bedside cabinets do not add to the security of the process. Next, the time study showed that the pharmacy technician’s average hourly route takes approximately 12 minutes and the length of the run is highly correlated to the number of medications that need to be delivered. Other information from the route showed that 13% of medication cabinets are unlocked, which causes a security concern because all medications must be in a locked location.

Within the medication cabinet, 76% of the discontinued and expired medications were not transferred from the green bin to the red bin meaning that the nurses are not transferring medications like they should. This causes a concern of safety to the patient as well as increases the pharmacy technician's time removing medications. Finally, the data showed that stat
medications are not causing additional runs for the pharmacy technician since the main method of delivery is the tubing system (90% of medication orders).

Cost analyses were performed for both the Discontinued or Expired Medication Removal Study and Pharmacy Self-Collection Study. For the Discontinued or Expired Medication Removal Study, the total cost of medications returned to the Pharmacy at the end of the night was $523.49 over six days, or $31,845.64 annually. Further analyzing this cost showed that 86% of the cost ($27,475.38 annually) was due to non-expired medications that had to be wasted. Analyzing the data based on the medication due date and time showed that 43% of the cost ($13,738.60 annually) was for medications that were not past their date and time. For the Pharmacy Self-Collection Study, the total cost of remade medications for the 13 day study was $853.38 or $25,956.98 annually. Further analysis showed that 92% ($24,003.92 annually) of the remade medications were due to late or lost medications.

**Recommendations**

The team developed recommendations in three key areas: patient safety, cost of wasted medications, and pharmacy technician dissatisfaction.

**Patient Safety**

A brief description of the patient safety recommendations include creating a list of discontinued or expired medications for pharmacy technicians to take on their runs so as to know what medications to remove. The team also recommends having a Medication Removal Standardized Work Display for the pharmacy technicians and nurses inside of the cabinets, and reminders for nurses near the computer inside of the patient room. Lastly, for patient safety cabinets include soft and automatic closings doors to reduce unlocked cabinets.

**Cost of Wasted Medications**

A brief list of recommendations to reduce the cost of wasted medications include utilizing a medication scanning system to track where medications are at all times, placing medications in medication room contact patients. These will help reduce lost medications as well as medications wasted because they were in contact with a viral illness but not used.

**Pharmacy Technician Dissatisfaction**

A brief description of the pharmacy technician dissatisfaction recommendations include organizing informative meetings for pharmacy technicians to address their concerns with the bedside medication delivery process. To improve cabinet lighting at night, the team recommends providing the nightly cart runners with small flashlights to improve cabinet lighting. Lastly the team recommends taping off regions on the floor to specify what area objects (chairs, computers, etc) should not be placed into allow the pharmacy technicians a clear path to the bedside cabinet.
Introduction

In December 2011, the University of Michigan C.S. Mott Children’s Hospital opened the doors of its new hospital to patients and their families. With the new hospital came a new medication delivery process in the General Care Unit. In the old hospital, medications were delivered to a centralized locked medication room for nurses to retrieve for their patients. The new bedside medication delivery process brings non-narcotic and non-refrigerated medications to a locked cabinet within the patient’s room, and the other medications to a central locked medication room. It is believed that the efficiency of the delivery process decreases the amount of time nurses spend looking for medication and increases the overall quality of patient care. Within this process though, there is a gap in knowledge in its effectiveness. The goal of the project was to determine the effectiveness of the current bedside medication process by analyzing the utilization of the pharmacy technician’s time, the cost of lost or late medication, and the number of cabinets that were locked and the old medications within them are removed in a timely manner. Together, these all affect the most important goal of the delivery process: the quality of patient care. A team from the Industrial and Operations Engineering 481 class was asked to analyze the current delivery process. The purpose of this document is to present the findings, conclusions, and recommendations of the project.

Background

A Medication Manager Pilot was conducted in 2006 to test a new process of delivering medication from the Pharmacy to the patient’s bedside for the ICU at the old C.S. Mott Children’s Hospital. Previously, the medication was delivered to medication rooms, from which the nurses retrieved the medication and brought it to the bedside. From September to December 2007, data was collected concerning the old process of medication delivery, to provide baseline information to compare with. In January to April 2008, data was collected using the new Medication Manager process. Finally, an analysis was performed comparing the data from before and after the change in process. With the old process, concerns arose about nursing time away from patients, drug waste, and staff satisfaction. It was decided that the new bedside medication management process would be implemented throughout the new C.S. Mott Children’s Hospital, recently opened in December 2011.

In the General Care Units the bedside medication delivery process consists of a pharmacy technician delivering the medications on an hourly run throughout the day. At night, all of the patients’ medications for the night are delivered in a single run called a cart run. The non-narcotic medications delivered to the bedside are placed within the bedside medication cabinet, which can be found in Figure 1.
Within the bedside medication cabinet, two bins are present to hold medication. The green bin should contain only good medications while the red bin should contain medications for the pharmacy technician to remove. Unmoved medication causes the technician to take more time to sort through the bins, as well as creates a risk of giving bad medication to the patient. A discrepancy existed concerning whether the responsibility to move the medications from the green bin to the red bin belonged to the nurses or pharmacy technicians.

The main problem is how the project affects the continuous improvement of patient safety within the General Care Unit. The cause of the problem stems from a lack of both quantitative and qualitative data. Quantitatively, there have been lost or unused medications, which lead to high costs and interrupt patient care. Also, a concern existed with how discontinued or expired medications were removed from the room. Qualitatively, a lack of knowledge concerning how the new bedside medication process has affected the pharmacy technicians, nurses, and parents of the patients was present.

**Key Issues**

The following key issues drove the need for this project:

- Continuous improvement of patient safety within the general care unit
- Lost or unused medication due to a lack of communication between nurses and pharmacy technicians is costly
- Even workload distribution between the nursing and pharmacy technician resources based on the priority of responsibilities
● Pharmacy technicians routes around the hospital may be time consuming and contain wasted walking
● Quantitative data not collected regarding the current bedside delivery process in the general care unit
● Qualitative data not collected concerning the satisfaction of the process with nurses, Pharmacy technicians, and parents of patients

Goals and Objectives
The primary goal for the project was to validate the effectiveness of resources for the bedside medication management process for the patients in the Pediatric General Care Units of the C.S. Mott Children's Hospital. Improvements from this project will increase patient safety, decrease the cost of missing or wrong medications, validate or disprove the effectiveness of the bedside medication delivery system, and improve the working conditions for nurses and pharmacy technicians. To achieve these goals, the team addressed the following objectives:

- Identify the allocation of resources from the Pharmacy and nursing staff within the process
- Determine employee, patient, and parent satisfaction
- Quantify the cost of lost or unused medication from the current process

Project Scope
This project included only the bedside management of medications for pediatric inpatients in General Care Units in the Children's Hospital. Specifically, the team observed the following units: 7 East, 11 West, 12 East, and 12 West. The bedside medication management process begins when the medication is ordered and ends when the patient is discharged and leftover medication is cleared from the bedside cabinet. The team also considered the concerns and opinions from the patients’ parents.

Any units outside of the Pediatric General Care Units were excluded from this project. Specifically, the team did not observe the CW 7 West or 11 East unit, ICU, or the role of the Medication Managers. The team also did not analyze the process of ordering the medication by the nurses from the Pharmacy. Finally, the team did not look into the medication production process.

Methods and Findings
To gain both quantitative and qualitative data, the team organized the data collection into four main groups:
1. Surveys
2. Pharmacy Technician Delivery Route
3. Medication Information
4. Medication Cost Analyses

Surveys
The team created and distributed surveys to the nurses and pharmacy technicians who work with the General Care Units. The team also interviewed four parents of former patients. The Nursing and Pharmacy Technician Surveys contained yes/no questions, numeric 1-10 rating scales, and open-ended questions. The Parent Survey contained only open ended questions. To analyze the data, the first two types of questions were entered into Excel. Within answers for yes/no questions, the team looked at the percentage of “yes” to “no” answers to determine if there was a majority opinion on the question. The team created distributions to determine the most frequent responses for the rating scales. The team searched for trends in comments, as well as any concerns within the open-ended questions.

Method: Nursing Survey Collection
The Nursing Survey had three main objectives:
1. Assess the satisfaction of nurses in regards to the current bedside medication delivery system.
2. Discover any problems that nurses have found with the process.
3. Determine the steps that nurses take when looking for their patients’ medication.

The survey was developed by the team, the Lean Coach (Coordinator), and Pediatric Safety Coordinator (client) to determine nursing satisfaction with the delivery process and determine whether a time study of nurses would be necessary. A sample of the nursing survey with results can be viewed in Appendix A. The team placed the surveys in the nurse staff rooms in each unit for one week, from October 12 - October 19, 2012. The nursing staff was asked to fill out the survey at their own convenience, but it was not required. Throughout the week a total of 77 surveys were completed and collected.

Method: Pharmacy Technician Survey Collection
The Pharmacy Technician Survey had three main objectives:
1. Assess the satisfaction of pharmacy technicians in regards to the current bedside medication delivery system.
2. Discover any problems that pharmacy technicians have found with the process.
3. Determine the cause of late or lost medications.

The survey was developed by the team to determine if the technicians saw the process the same way that the nurses did. A sample of the Pharmacy Technician Survey, with results, can be
viewed in Appendix B. The team placed the surveys in the pharmacy staffing room on the 10th floor for one week, from November 19-November 26, 2012. The pharmacy technicians were asked to fill out the survey at their own convenience, but it was not required. Throughout the week a total of 32 surveys were completed and collected.

**Method: Parent Survey Collection**

The Parent Surveys had two main objectives:

1. Determine if parents noticed a change in the medication delivery process.
2. Understand the impact of the bedside medication delivery process on the patient’s family

The content of the survey was developed by the team to determine how the presence of the medication in a patient’s room affected their parents and family members. A sample of the Parent Survey can be viewed in Appendix C. The team gained three parents’ contact information through the hospital and another that works on the Ped’s Med Safety Team with the Pediatric Safety Coordinator. The survey was conducted on November 16. The team called each parent and had one team member ask the questions while the other two members took notes.

**Survey Finding: Satisfaction with Bedside Medication Delivery**

One of the largest gaps in knowledge was how the new delivery process affected the nurses and pharmacy technicians. Figure 2 shows that the nurses and pharmacy technicians report different levels of satisfaction with the process.

![Figure 2: Nurses are more satisfied than Pharmacy Technicians with the new process](image)

Source: IOE 481 Nursing Survey, Data Collection Period: 10/12/12-10/19/12, n=75
Source: IOE 481 Pharmacy Technician Survey, Data Collection Period: 11/19/12-11/26/12, n=32
As shown in Figure 2, the nurses responded that they are satisfied with the new process, while the pharmacy technicians on average are dissatisfied with it. Other results from the Pharmacy Technician Survey indicate that the technician dissatisfaction may be partially caused by objects in the way of the cabinets and lighting issues. The distributions can be seen in Figures B-12 and B-13 in Appendix B.

Also leading to the dissatisfaction is the extra work caused medications not being moved from the green bin to the red bin. The technicians were asked how often nurses moved medications from the green bin to the red bin, while nurses were asked how often technicians remove medications from the cabinet. Figure 3 shows that both groups responded that the other group does not perform their responsibility.

The pharmacy technicians' response could also be an indication of their response for the question concerning whether the cabinets provide adequate medication security or not as seen in Figure 3. The nurses on the other hand responded that the cabinets do provide adequate medication safety.
Figure 4: Nurses and Pharmacy Technicians’ responses indicate a disagreement for whether the cabinets improve medication security

Source: IOE 481 Nursing Survey, Data Collection Period: 10/12/12-10/19/12, n=74
Source: IOE 481 Pharmacy Technician Survey, Data Collection Period: 11/19/12-11/26/12, n=32

The team compiled the Pharmacy technician comments from the survey and found that of the technicians who left a comment, 34% of them said that they do not like the new bedside delivery method and that medications should be delivered to the medication rooms. Objects being in the way of the cabinets accounted for 25% of the comments and another 22% of the comments were concerned with spreading germs between rooms as technicians deliver medications from room to room.

Parent responses indicate that they are very satisfied with the new process. 3 out of the 4 parents indicated that they noticed the new delivery process and that the thought it was a positive change. Parents indicated that their child's medication being inside of their room provided a sense of security because it minimized the chance of error. Finally, 2 out of the 4 parents enjoyed being able to watch the nurse administer medications, and learned how to do it when it was time to administer medication at home. Appendix C has summary responses to each question.

**Pharmacy Technician Delivery Routes**

The team conducted time studies on the pharmacy technicians as they delivered medications to the bedside. The time frame for the data collection was from October 31-November 12, 2012. Medication delivery occurs with an hourly run throughout the day and with one bulk run with a cart that delivers all medications needed for the night to the 11th and 12th floor. The team collected data on 27 hourly runs and 3 cart runs. The hospital has two pharmacies that serve the General Care Units, one on the 10th floor and one on the 7th floor. Since the 10th floor serves three-fourths of the General Care Units, the team spent three-fourths of their time on the 10th floor, and the remaining time on the 7th floor. The “Pharm Tech Hourly Time Studies” sheet that the team used can be found in Appendix D.
Method: **Pharmacy Technician Time Study**

When an hourly run began, the team member collecting data recorded the time of the run, and the initial location as the Pharmacy. Throughout the run, the team member collected the times and locations of the pharmacy technician. Table 1 shows how the time was started and stopped for each location that the technician was present.

Table 5: Time Start and End Points for Each Location Type

<table>
<thead>
<tr>
<th>Time Measured</th>
<th>Start Point</th>
<th>End Point</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Walk Time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Rooms</td>
<td>Pharmacy Technician leaves the door of the room</td>
<td>Pharmacy Technician enters the door of the room</td>
</tr>
<tr>
<td>Stairs</td>
<td>Pharmacy Technician enters the door of the stairwell</td>
<td>Pharmacy Technician leaves the door of the stairwell</td>
</tr>
<tr>
<td><strong>Waiting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevator</td>
<td>Button to call the elevator is pushed</td>
<td>Pharmacy Technician exits the elevator</td>
</tr>
<tr>
<td>Interruptions</td>
<td>Pharmacy Technician stops walking toward next destination to deliver medication</td>
<td>Pharmacy Technician begins to move toward next destination to deliver medication</td>
</tr>
<tr>
<td><strong>Medication Delivery</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient or Medication Room</td>
<td>Pharmacy Technician enters the room through the door</td>
<td>Pharmacy Technician leaves the room through the door</td>
</tr>
</tbody>
</table>

Method: **Medication Information and Locked Cabinets**

While the team performed the time studies on the delivery runs, data was also collected on:
1. Number of medications delivered per room
2. Medication Due Date
3. Type of Medication
4. Whether the cabinet was locked

The team asked the pharmacy technician for the medication information before they entered the room and about the cabinet status after they left the room. On cart runs, all bedside cabinets were checked to determine if they were locked, even if there was no medication to deliver.
Finding: Timeliness of Medication Delivery

The Pharmacy Technician Delivery Routes brought about two main findings about the timeliness of the medication delivery. Three types of medications exist: initial, batch, and print. The initial and print medication due dates are listed as the time that the order is received by the Pharmacy and then are delivered as soon as possible. The batch medications are scheduled medications that have a due time designated by their doctor. The team looked only at the batch medications to determine the percent of these that were late, meaning they were not in the medication cabinet by their due time, compared to early. Figure 4 shows a breakdown of the timeliness of the batch medications.

![Pie chart](image)

**Figure 5: Majority of batch medications were early**

Source: IOE 481 Time Study, Data Collection Period: 10/31/12-11/12/12, n=65

The next finding was the correlation between the amount of time taken to deliver medications and the number of medications being delivered. The team calculated a correlation of .68, which indicates a strong positive relationship between delivery time and number of medications.

Finding: Locked Cabinets

One of the key concerns with the safety of the bedside medication process was whether the cabinets were being locked after medications were added or removed. Over the two weeks of collection, the team checked bedside cabinets 211 times on 7E, 11W, 12E, and 12W during both hourly and cart runs. The team found that 13% of the cabinets were unlocked. Under hospital regulations, medications must be locked at all times.

Medication Information

When a medication is no longer needed, either because it expired or changed, the medication is supposed to be moved from the green bin to the red bin inside of the medication cabinet. The medication is then removed from the red bin by the pharmacy technician. If the medication is not moved over, the technician must sort through the green bin to find bad medications. Failing to move medications can also cause danger to patients if old medications are accidentally given, and good medications could accidentally be removed.
Method: Discontinued or Expired Medication Removal

The team collected medications that were expired or discontinued from November 13 to November 20, 2012. This collection was performed on the nightly cart runs performed by the pharmacy technicians for the 11th and 12th floor. To collect the medications, the team provided a red bin and a green bin to bring on the cart run. When medications from the bedside cabinet were removed from one color bin, the technician placed the medication in the same color bin that the team gave them to collect all medications. At the end of the run, the medications would be set aside for the team to collect information about that night.

Finding: Discontinued or Expired Medication Removal

The team found that 74% of the 386 medications collected were brought back in the green bin. The team also wanted to know of the medications, how many were expired compared to not expired. Figure 6 shows that 86% of returned medications were not expired. It also shows that of the expired medications, 10% were in the green bin.

![Figure 6: Over half of the medications that came back expired were left in the green bin](image)

Source: IOE 481 Expired Medication Study, Data Collection Period: 11/13/12-11/20/12, n=255

Having expired medications in the green bin creates concerns with the safety of medication being given to a patient because it increases the chance of a mistake. The team also analyzed the medication to determine how medications were being returned based on their due date. The results can be found in Figure 7.
Figure 7: Majority of Medications Returned were Past Due and in the Green Bin

Source: IOE 481 Expired Medication Study, Data Collection Period: 11/13/12-11/20/12, n=213

Figure 7 shows that the majority of medications returned were past their due date. The majority of past due medications were returned in the green bin, which increases the chance of a nurse giving a patient bad medication.

To determine which units provided the most medications, the team compared the percentage of the total medication a unit returned to the Pharmacy with the percentage of the overall bed occupancy over the 6 days of the study. Figure 8 shows that 12E and 12W provided a higher percentage of medication to the total than the contribute to the total bed occupancy.

Figure 8: Percentage of Total Medications Returned from Floor 12 Exceed the Percentage of Total Occupancy

Source: IOE 481 Expired Medication Study, Data Collection Period: 11/13/12-11/20/12, n=200
Source: IOE 481 Census Data, Data Collection Period: 11/13/12-11/20/12, n=469
Method: Pharmacy Self-Collection Sheets

The team created three self-collection sheets that were left in the pharmacies. The three sheets were:

1. A call log for the number of calls that were received by the Pharmacy about missing medication
2. A log to enter information when a medication could not be delivered to the patients’ room for any reason
3. A log to enter information about medications that were needed immediately (stat medications)

An example of each of these self-collection sheets can be found in Appendix D. For the call log, when a nurse called the Pharmacy because a medication was missing, whoever answered the phone recorded the unit and whether the medication was found or had to be remade and redelivered. If the medication had to be remade and redelivered, the name and dose of the medication was recorded along with the reason it needed to be redelivered.

When a medication could not be delivered, the pharmacy technician recorded the date, unit the medication was supposed to be delivered to, time of the run, and reason for being unable to deliver the medication. Finally, for stat medications, the time was recorded as well as the unit and method of delivery of the medication.

The team placed the sheets throughout each Pharmacy near phones and computers where stat medications were ordered. The team also trained the technicians and pharmacists to collect the data. All of the sheets were left in the Pharmacy from October 31-November 12, 2012, with the team periodically checking with the pharmacies to ensure the data collection process ran smoothly.

Finding: Stat Medication

The key finding from the data collection on stat medication was the route of delivery. As seen in Figure 9 below, 90% of the stat medication was delivered through the tube system.
Figure 9: Tube System is Primary Mode of Transporting Stat Medications

Source: IOE 481 Self-Collection Sheets, Data Collection Period: 10/31/12-11/12/12, n=30

Figure 9 shows that the other options of delivery were with the pharmacy technicians’ hourly run or the nurse picking up the medication from the Pharmacy.

**Medication Cost Analyses**

Two costs to the Pharmacy concerning medications include medication remakes and discontinued or expired medication. Medications are remade when they are lost or late in their delivery to the patient room or if the dose changes. Discontinued, expired, or past due medications cannot be reused for safety reasons.

**Method: Remade and Discontinued or Expired Medications**

The Pharmacy Call Log (Appendix D) that the team created, collected information about medications that needed to be remade. Pharmacy employees recorded the information after each phone call which included the drug name, dose, and method that the drug was administered. During the Discontinued or Expired Medication Study, the team recorded the names, doses, and method that the drug was administered or any medication that could not be reused. This data was then sent to the Pediatric Safety Coordinator to price the data.

**Finding: Expired or Discontinued Medication Cost**

The team received a list of the medications collected and their prices by both Unit Cost, which is the cost of only the drug, and the Unit Charge, which is the price the hospital pays for the final product (drug, packaging, etc.). The team also received occupancy data for 11W, 12E, and 12W during the six day study. The data showed that 469 of the possible 510 beds were filled, giving the team the ability to break down the cost per bed based on 92% occupancy.

The team analyzed the costs of the medications based on whether they were expired or past their due date from the Discontinued or Expired Medication Removal Study. From the study, the Unit
Cost was $523.49 and the Unit Charge was $3,151.74. On an annual basis, the Unit Cost for medications being returned to the Pharmacy cost $31,845.65. Table 2 shows the cost of these medications based on whether the medication was expired or not.

Table 6: Cost of Expired Medications (and Percentage of Total) Based on Expiration

<table>
<thead>
<tr>
<th>Expired (% of total medications)</th>
<th>Total Unit Cost</th>
<th>Annualized</th>
<th>Annual Cost Per Bed (92% occupancy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No (81%)</td>
<td>$451.65 (86%)</td>
<td>$27,475.38</td>
<td>$58.58</td>
</tr>
<tr>
<td>Yes (19%)</td>
<td>$71.84 (14%)</td>
<td>$4,370.27</td>
<td>$9.32</td>
</tr>
<tr>
<td>Total</td>
<td>$523.49</td>
<td>$31,845.64</td>
<td>$67.90</td>
</tr>
</tbody>
</table>

Source: IOE 481 Expired Medication Study, Data Collection Period: 11/13/12-11/20/12, n=174

The table shows that the majority of medication costs that were returned to the Pharmacy came from unexpired medications. It also showed that there were not many medications that were significantly more expensive than others since the percent medication is close to the percent cost.

The team also analyzed the data to see what part of the cost could be contributed to medications that were returned to the Pharmacy before their due date. The breakdown can be found in Table 3.

Table 7: Cost of Expired Medications (and Percentage of Total) Based on Due Date

<table>
<thead>
<tr>
<th>Past Due Date? (% of total medications)</th>
<th>Total Unit Cost</th>
<th>Annualized</th>
<th>Annual Cost Per Bed (92% occupancy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No (22%)</td>
<td>$225.84 (43%)</td>
<td>$13,738.60</td>
<td>$29.29</td>
</tr>
<tr>
<td>Yes (78%)</td>
<td>$297.65 (57%)</td>
<td>$18,107.04</td>
<td>$38.61</td>
</tr>
<tr>
<td>Total</td>
<td>$523.49</td>
<td>$31,845.64</td>
<td>$67.90</td>
</tr>
</tbody>
</table>

Source: IOE 481 Expired Medication Study, Data Collection Period: 11/13/12-11/20/12, n=174

The table shows that the majority of costs for medications returned to the Pharmacy was for medications that were past their due date. The not past due medications only make up 22% of the total medications, but contribute to 43% of the cost because the medications were more expensive in terms of Unit Cost.
**Finding: Remade Medication Cost**

The team also analyzed the data for the cost of medications from the Pharmacy Self-Collection Studies. During the two week study, the Unit cost was $853.38 and the Unit Charge was $4,052.02. Annually, the Unit Cost for medications was $25,956.98. Table 4 shows how the total costs breakdown by reason that the medication had to be remade and delivered.

Table 8: Cost of Remade Medications (and Percentage of Total) Based on Reason

<table>
<thead>
<tr>
<th>Reason Remade</th>
<th>Unit Cost</th>
<th>Annualized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late/Lost</td>
<td>$ 789.17 (92%)</td>
<td>$ 24,003.92</td>
</tr>
<tr>
<td>Other</td>
<td>$ 63.45 (7%)</td>
<td>$ 1,929.94</td>
</tr>
<tr>
<td>Room Change</td>
<td>$ 0.38 (0%)</td>
<td>$ 11.56</td>
</tr>
<tr>
<td>Dose Change</td>
<td>$ 0.38 (0%)</td>
<td>$ 11.56</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 853.38</strong></td>
<td><strong>$ 25,956.98</strong></td>
</tr>
</tbody>
</table>

Source: IOE 481 Self-Collection Sheets, Data Collection Period: 10/31/12-11/12/12, n=71

The table shows that the majority cost for remade medications is due to Late/Lost Medications.

**Conclusions**

For the new bedside medication delivery process, a gap in knowledge existed of how the new process is affecting the jobs of the nurses and Pharmacy technicians, the quality of care for the patients, and how costly the new process is in terms of remade and wasted medications.

**Surveys**

The Pharmacy Technician and Nursing Surveys revealed different opinions on the process. The nurses on average are satisfied with the process and feel that it adds to the safety of the medication process. The Pharmacy technicians, on the other hand, are dissatisfied with the process and responded that the medication cabinets do not add safety. They cited items in the way of the cabinets, occasional lighting issues, and a failure by the nurses to move discontinued or expired medication to the appropriate bin. Technician comments also suggest that they are concerned with having to the rooms of patients who have contagious illnesses frequently. The difference in the opinions of the process show that the new process is helping the nurses. Unfortunately, unexpected circumstances such as items blocking the cabinets have impacted the pharmacy technicians jobs negatively.
The Parent Surveys revealed that the majority of parents who had experience with the old and new bedside medication management process responded that the process was beneficially. For instance, the parents like how medications are kept close by at the bedside. They find it convenient for nurses and like being able to see the nurses double check to make sure the medication is correct for their child. Participating parents responded that this leads to a safer process. The majority of parents also said that it was beneficial to see nurses administer medication to their child and that medications were readily available and timely.

**Pharmacy Technician Delivery Route**

The Pharmacy Technician Delivery Route study revealed concerns about the timeliness of and safety of medications. The time study portion showed that there is a strong positive correlation between the number of medications and the time it takes to deliver them. No concerns exist with the amount of time that technicians spent performing the hourly run. The timeliness of batch medications provided a slight concern. Some of the medications were late, meaning they were either on the way or not in the cabinet at the due time. Unlocked cabinets provided a lot of concern. They allow patients or others to have access to medications which can cause harm to the patient. All medications must be in a locked space, so even one unlocked medication cabinet is too many.

**Medication Information**

The findings from the removal of expired or discontinued medications cause much concerns. With at least 41% of medications in the green bin belonging in the red bin, there is a risk of the old medication being given to a patient, which puts them in danger. These excess medications also increase the time it takes for the technician to remove discontinued or expired medications from the room. With the majority of stat medications being sent to units by the tubing system, there is no concern with the amount of time delivering stat medications takes for the Pharmacy technicians.

**Cost Analysis**

Cost analyses were performed for both the Discontinued or Expired Medication Removal Study and Pharmacy Self-Collection Study. For the Discontinued or Expired Medication Removal Study, the total cost of medications returned to the Pharmacy at the end of the night was $523.49 over six days, or $31,845.64 annually. Further analyzing this cost showed that 86% of the cost ($27,475.38 annually) was due to non-expired medications that had to be wasted. Analyzing the data based on administering date and time showed that 43% of the cost ($13,738.60 annually) was for medications that were not past their date and time.
For the Pharmacy Self-Collection Study, the total cost of remade medications that were called in for the 13 day study was $853.38 or $25,956.98 annually. Further analysis showed that 92% ($24,003.92 annually) of the remade medications were due to late or lost medications.

**Recommendations**

The team developed recommendations in three key areas: patient safety, cost of wasted medications, and pharmacy technician dissatisfaction.

**Patient Safety**

When focusing on patient safety one of the main concerns involved the removal of discontinued or expired medications within patient rooms. Since 74% of discontinued and expired medications were found in the green bin the team recommends the following to increase accuracy:

1. Make a list of discontinued or expired medications that can be used by pharmacy technicians when removing medications from the patient bedside cabinets. This would provide a confirmation system for pharmacy technicians to know they are removing the appropriate medications.
2. Create a standardized list of responsibilities to clearly describe the Pharmacy technician and nurses role with the removal process. This list should be placed inside of each cabinet for easy access to settle responsibility disputes.
3. Include reminders near the computer for the nurses about transferring medications. This recommendation would reduce the chance of nurses forgetting to transfer the medication over to the designated red bin.

Along with discontinued or expired medication removal, unlocked cabinets also affect patient safety. The team found that 13% of cabinets were unlocked for a week worth of data collection. To address this issue the team recommends using soft and automatic closing cabinet doors to reduce the amount of unlocked cabinets.

**Cost of Wasted Medications**

The team found that remade medication cost the hospital a projected amount of $25,956.98 a year. To reduce this cost, a medication scanning system that would track medication locations at all times. This would provide a way for nurses to track medications, thus reducing lost or late medications from being remade.

The team also found that discontinued or expired medications cost the hospital a projected amount of $31,845.64 annually. To reduce this cost, the team recommends that medication for contact rooms be placed inside of medication rooms. The moment the medication goes into the bedside cabinet within a contact room, that medication cannot be reused for any other patient. So
placing medication that potentially could be used for other patients, including common pill medication, inside of the medication room could reduce the cost of wasted medication.

**Pharmacy Technician Dissatisfaction**

Data from the Pharmacy Technician Surveys indicated that pharmacy technicians are dissatisfied with certain aspects of the bedside medication delivery process. For instance, 43% of pharmacy technicians thought the new bedside medication delivery process was worse than the old delivery process. In terms of cabinet safety, 69% of Pharmacy technicians stated that cabinets did not provide adequate medication security. To address these issues the team recommends to hold informative meetings with the pharmacy technicians to go over concerns pertaining to differences of the new bedside medication delivery process with the old delivery process. If pharmacy technicians understood the reasons for the changes then satisfaction could increase.

Pharmacy technicians also indicated that lighting within the medication cabinet can also be an issue. To address this issue, the team recommends providing nightly cart runners with small flashlights for cabinet lighting. We wouldn’t recommend placing a small light within the cabinet because that would be a fire hazard. Finally, pharmacy technicians also indicated that objects were often in the way of the bedside medication cabinet. To address the issue, the team recommends taping off regions on the floor to specify where objects should not go.

**Expected Impact**

With the completion of the Bedside Medication Management Project the team provided conclusions from the data about the effectiveness of the current process. Specifically, the conclusions could potentially impact the following:

- Quality of patient care and medication accuracy
- Satisfaction of the nurses, pharmacy technicians, and parents with the bedside medication process
- Organization of medication delivery
- Cost of lost and discontinued medication

Quality of patient care and medication accuracy could be impacted with the team’s findings through unlocked cabinets, expired, and discontinued medications. Nursing satisfaction could increase with more timely medications. Pharmacy technician satisfaction could increase with informative meetings, and addressing issues related to cabinet security and objects in the way. Organization of medication delivery could be impacted especially with cart run medication delivery. Cost of lost and discontinued medication could experience be reduced in areas relating to medications that are placed inside of contact rooms, and medications that are lost or late and have to be remade.
Appendix A: Nursing Survey and Results

Nursing Procedural and Satisfaction Survey
There is currently a lack of data concerning the bedside medication process in the General Care Units and we need your help!! So please, take a couple of minutes, enjoy a piece of HIGH QUALITY CANDY (or two...) and help improve the process.

1. When do you check to see if the medication for your patient is in the expected location? (circle one)

![Bar Chart]

Figure A-1: Most Nurses Check for Medications Half an Hour Before Due or Later
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=82

a) If you check at beginning of shift and medication is not present, what would you do first? (circle one)

| Contact Pharmacy | Check again closer to when dose is due | Other: ____________ |

![Bar Chart]

Figure A-2: Nurses Who Check at the Beginning Check Again Closer to Due Time
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=59
b) If you check at any other time, and medication is not present, what would you do first? (circle one)

<table>
<thead>
<tr>
<th>Contact Pharmacy</th>
<th>Check alternative bin in cabinet</th>
<th>Search in another location</th>
<th>Other: ____________</th>
</tr>
</thead>
</table>

Figure A-3: Nurses Who Check at Other Times Contact Pharmacy if Medication Not Present
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=95

<table>
<thead>
<tr>
<th>Contact Pharmacy</th>
<th>Search in another location</th>
<th>Check alternative bin in cabinet</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

c) If the pharmacy technician had a phone or pager would you contact them directly before the Pharmacy? (circle one)

Yes: 75%
No: 25%

Figure A-4: Nurses Would Contact Pharmacy technicians if They Have a Phone
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=69
2. How often are the medication deliveries that get to your patients room accurate?

![Bar chart showing accuracy of medication deliveries]

Figure A-5: Nurses Indicate Deliveries are Accurate Most of the Time
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=77

a) What are common causes for inaccurate medication? (circle all that apply)

- Wrong medication
- Wrong patient
- Wrong dose
- Wrong time

![Bar chart showing causes of inaccurate medication]

Figure A-6: Nurses Respond the Wrong Time and Wrong Dose are Most Common Inaccuracies
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=101
3. Did you work at the old Mott Children’s Hospital? (circle one) Yes No

Figure A-7: Most Nurses that Responded Worked in Old Hospital
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=77

a) If yes, how does the new bedside medication delivery process compare to the old medication delivery process?

Figure A-8: Most Nurses Agree New Process is not Worse than Old Hospital
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=58
4. What is your overall satisfaction with medications being delivered to the bedside?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissatisfied</td>
<td>Neutral</td>
<td>Satisfied</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of responses

![Bar chart showing satisfaction levels]

Figure A-9: Nurses are Satisfied Overall with the Delivery Process
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=75

5. How often are your medications being delivered on time?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>Sometimes</td>
<td>Always</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of responses

![Bar chart showing delivery frequency]

Figure A-10: Nurses Respond that Medications are Mostly On-Time
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=75
6. How often are discontinued/expired medications removed from the bedside by the pharmacy technicians?

![Graph showing the frequency of medication removal by pharmacy technicians.]

Figure A-11: Nurses Responded that Pharmacy Technicians Rarely Remove Medications
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=75

7. How do you think bedside medication delivery impacts patient safety?

![Graph showing the impact of bedside medication delivery on patient safety.]

Figure A-12: Nurses Responded that the New Process Positively Impacted Medication Safety
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=74
8. Do you think the current bedside medication cabinets provide adequate medication security? (circle one) Yes No

![Pie chart showing 86% Yes, 14% No]

Figure A-13: Nurses Responded that the New Process Provides Adequate Medication Safety
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=74

9. If you could change one thing about the current bedside medication delivery process what would it be?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

![Bar chart showing responses]

Figure A-14: Nurses Would Make the Medication Delivery Sooner the Most
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=46
10. Please indicate which unit you work in. (circle one)

Figure A-15: Nurses Would Make the Medication Delivery Sooner the Most
Source: IOE 481 Survey, Data Collection Period: 10/12/12-10/19/12, n=70
Appendix B: Pharmacy Technician Survey and Results

Pharmacy Technician Survey

There is currently a lack of data concerning the bedside medication process in the General Care Units and we need your help!! So please, take a couple of minutes, enjoy a piece of HIGH QUALITY CANDY (or two...) and help improve the process.

1. Did you work at the old Mott Children’s Hospital? (circle one)        Yes          No

Figure B-1: Most Pharmacy Technicians Worked in the Old Hospital
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=32

a) If yes, how does the new bedside medication delivery process compare to the old medication delivery process?

<table>
<thead>
<tr>
<th>New worse than old</th>
<th>New same as old</th>
<th>New better than old</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure B-2: Most Pharmacy Technicians Responded that the New Process is Worse than the Old Process
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=20
2. What is your overall satisfaction with medications being delivered to the bedside?

![Bar Chart]

Figure B-3: Most Pharmacy Technicians are Dissatisfied with the Bedside Medication Delivery
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=32

3. Would it be useful if the runners to the 11th and 12th floors had a mobile phone or pager on them for the bedside medication delivery process? (circle one)  Yes  No

![Pie Chart]

Figure B-4: Almost all Pharmacy Technicians Responded that a Phone or Pager for the Runner would be Helpful
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=31
3a) What would be some of the benefits of them having a mobile phone or pager? (circle all that apply)

- Easier contact with nurses
- Easier contact with Pharmacy
- No benefit
- Other

<table>
<thead>
<tr>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

Easier contact with Nurses Easier contact with Pharmacy No Benefit Other

Figure B-5: Main Reason for a Phone is that it Would Allow Easier Contact with the Pharmacy and Nurses
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=58

4. What are common causes for remade medication? (rank in order of most frequent (5) to least (1))

- Late/Lost
- Changed dose
- Wrong patient
- Dropped Med
- Other

<table>
<thead>
<tr>
<th>Average Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.00</td>
</tr>
<tr>
<td>4.50</td>
</tr>
<tr>
<td>4.00</td>
</tr>
<tr>
<td>3.50</td>
</tr>
<tr>
<td>3.00</td>
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<tr>
<td>2.50</td>
</tr>
<tr>
<td>2.00</td>
</tr>
<tr>
<td>1.50</td>
</tr>
<tr>
<td>1.00</td>
</tr>
<tr>
<td>0.50</td>
</tr>
<tr>
<td>0.00</td>
</tr>
</tbody>
</table>

late/lost changed dose wrong patient dropped med OTHER

Figure B-6: Pharmacy Technicians Respond that Late/Lost Medications is the Most Common Cause for Remade Medications
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=32

36
5. When during a day do you check for expired meds within the bedside medication cabinet? (circle all that apply)

- When a patient is discharged / room change
- Every hour
- Every delivery
- End of shift
- Never
- Other ________

Figure B-7: Most Pharmacy Technicians Check for Expired Medications at Every Delivery
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=45

6. How often do nurses transfer expired/discontinued medications to the red bin within the bedside medication cabinet?

- 1 Never
- 2 Sometimes
- 3 Always
- 4 Never
- 5 Sometimes
- 6 Always
- 7 Never
- 8 Sometimes
- 9 Always
- 10 Never

Figure B-8: Pharmacy Technicians Respond the Nurses are not Transferring Medications to the Red Bin Frequently
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=28
7. How do you think bedside medication delivery impacts patient safety?

![Bar chart showing responses to the question about bedside medication delivery impacts on patient safety.]

Figure B-9: Pharmacy Technician Responses Show Disagreement for how the Bedside Medication Delivery Process Impacts Patient Safety
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=31

8. Do you think the current bedside medication cabinets provide adequate medication security? (circle one)  Yes  No

![Pie chart showing responses to the question about medication cabinets.

Yes 31%
No 69%

Figure B-10: Most Pharmacy Technicians Responded that the Bedside Cabinets Provide Adequate Medication Safety
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=32
9. How often do you find the bedside cabinets are locked?

![Bar chart showing the frequency of finding bedside cabinets locked.]

**Figure B-11:** Pharmacy Technicians Sometimes find the Medication Cabinets Locked  
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=32

10. How much of an issue is cabinet lighting when delivering medications to the cabinet?

![Bar chart showing the perception of cabinet lighting.]

**Figure B-12:** Pharmacy Technicians Respond that Cabinet Lighting can Sometimes be an Issue  
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=32
11. How often are objects (chairs, computer, etc) in the way of the cabinet?

![Bar chart showing frequency of objects in the way of the cabinet](chart1.png)

**Figure B-13:** Pharmacy Technicians Respond that there is Almost Always Objects in the Way of the Cabinet  
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=31

12. If you could change one thing about the current bedside medication delivery process what would it be?

__________________________  ________________________________  ________________________________
__________________________  ________________________________  ________________________________
__________________________  ________________________________  ________________________________

![Bar chart showing changes to bedside medication delivery process](chart2.png)

**Figure B-14:** Pharmacy Technicians Respond that they Would Change the Objects in the Way and Delivering to Contact Precautions  
Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=32
13. Please indicate which pharmacy you work in (circle one)

![Bar Chart](chart.png)

**Figure B-15: Most Pharmacy Technician Respondents Work on the 10th Floor**

Source: IOE 481 Survey, Data Collection Period: 11/19/12-11/26/12, n=30
Appendix C: Parent Survey and Responses

Survey Question 1:
How long have you and your child been involved with both the old and new hospital?

Question 1 Response:
The subject parents have experience with the hospital ranging from 10 months to 9 years.

Survey Question 2:
Between your time at the old and new hospital, did you notice a difference in how medications were delivered to the room?

Question 2 Responses:
3 out of 4 parents noticed a difference between the old and new hospital with medication delivery.

Survey Question 3:
What were some aspects of each system that you liked and aspects you didn’t like?

Question 3 Responses:
3 out of 4 parents who noticed a difference between the old and new hospital medication process responded with the following. Parents like the idea of medications kept right near their parents bedside. They also like that beside medications lead to additional double checks by nurses. Also they find it convenient for nurses. One of the parents mentioned that they preferred that the old process had medication handled by less people. Another parent responded with stating that they did not like the old delivery process because medications were not always on time and they believed there was a larger chance of wrong medications.

Survey Question 4:
Do you feel like it helped you to learn how to administer medications at home?

Question 4 Response:
2 out of 4 parents liked being able the nurse administer medications and felt it did help them learn more about the medication.

Survey Question 5:
Did you feel the child’s medication were readily available and timely?

Question 5 Response:
2 out of 4 parents thought medications were available and timely. 1 out of 4 felt they had to wait for medications.
Survey Question 6:
Any additional comments about bedside medication?

Question 6 Response:
One parent responded with: “It is moving in the right direction. More patient and family centered”. Another parent responded with: “Likes cabinet and being able to see it. Feels make nurse to double check the medication.”
### Appendix D: Data Collection Sheets

<table>
<thead>
<tr>
<th>Date</th>
<th>Time (24h)</th>
<th>Reason</th>
<th>Return Time</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>12:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>12:00</td>
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</tbody>
</table>

1. When returning a medication run, record any medication that was not to be delivered.
2. Please indicate any comments about the delivery.
3. Please indicate any comments about the delivery.
4. Once form is completely filled out, please in envelopes labeled "Completed Data Collection Sheets," and replace with new one.

---

**Description:**
- **Step 1:** Date
- **Step 2:** Time (24h)
- **Step 3:** Reason
- **Step 4:** Return Time
- **Step 5:** Notes

Additional instructions may be provided for the medication run, and a reason for the undelivered med.
<table>
<thead>
<tr>
<th>Room Drop</th>
<th>Form</th>
<th>Reason for Redelivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Order Lost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Late/Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Order Lost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Late/Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Order Lost</td>
<td></td>
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<tr>
<td>New Late/Other</td>
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<td>New Order Lost</td>
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<tr>
<td>New Late/Other</td>
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<tr>
<td>New Order Lost</td>
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<tr>
<td>New Late/Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reason for Redelivery:

DATE: 11/12/2012
<table>
<thead>
<tr>
<th>Comments</th>
<th>Partner Store</th>
<th>Method of Delivery (Circle One)</th>
<th>Time med. Gone to?</th>
<th>Time med. in Partner Store (Circle One)</th>
<th>Time med. Pick up</th>
<th>Time med. Delivered</th>
</tr>
</thead>
</table>

*Complete data for following forms:* TELL, EIV, LTE, IVY, TEIV, IVE, IVTE, IVEY.