INTERRUPTIONS IN THE PHARMACY: CLASSIFICATION, ROOT-CAUSE, AND FREQUENCY

By Julie Silver

Abstract

Interruptions in the healthcare field are prevalent. Yet, no studies combine type, frequency, and duration of interruptions. Interruptions can distract a pharmacist or technician from their process, thus increasing the risk of error. This observational research project recorded the distractions and interruptions in the central pharmacy of a large hospital. The source and time interval of the interruption was noted during the observation period. Overall, eight categories of interruptions were recorded with Clarifying Medications being the most time consuming. Analyzing type, root-cause, and duration of disruptions can lead to process improvement aims to reduce total interruptions in the pharmacy.

Introduction

Interruptions and distractions are constantly occurring at inpatient pharmacies and are major disruptions to the pharmacists and technicians who are working on vital tasks (Sobek, 2003). A distraction can be defined as “a stimulus from a source external to the pharmacist that was not followed by cessation of activity but by the pharmacist continuing productive efforts while responding in a manner that was observable. During the study, a pharmacist sometimes received a phone call, yet never ceased the initial job. This is considered a distraction to the original task. In contrast, an interruption is a signal in the pharmacy that distracts the pharmacists from the main task they are working on (Brixey, 2004). Here, the pharmacists completely stopped the initial task in order to address the interruption.

Signals often generate interruptions via communication devices such as telephones or doorbells that disrupt the pharmacists. Distractions to the medical professionals while they perform their tasks are major contributors for errors in the pharmacy (Subramoney, 2009). Their attention is divided between two tasks instead of completely focusing on one job. These increased medical errors may result in negative repercussions on the patients. Although most errors cause little harm to the patient, there are cases in which result in death or serious injury (Subramoney, 2009). It is known that such medical errors can have grave consequences for patients; therefore a system needs to be established to maximize patient safety (Knudsen, 2007). Implementations should be installed in the pharmacy to reduce interruptions and distractions for the pharmacists.

Literature Review

Interruptions are common in the pharmacy setting. Healthcare professionals realize that interruptions are a root-cause of human error (Yates, 2004). Sentara Norfolk General Hospital (SNGH) implemented an initiative to increase safety in the hospital by creating a culture that would produce more efficient and reliable worker performance levels. Their study observed workflow interruptions in the drivers of human error category, which was considered to be a fundamental organizational issue in many high-risk industries. Employees in this study evidently thought that efforts to implement a safer environment due to their strong desire to participate in ongoing safety initiatives. The plan proved to be worthwhile because of the increased pace of improvement for the safety of the Hospital (Yates, 2004). Additional research has been done in the healthcare field that identifies understanding interruptions as a crucial step when designing health systems (Brixey, 2005). Registered Nurses were observed during an observational study in order to quantify and identify the types of interruptions occurring in the Trauma Center. The study identified telephones, pagers and face-to-face conversations as common types of interruptions. The data showed that interruptions occurred anywhere from 3.9% to 30.2% during the observed time periods. Their study also
concluded that the physical layout of the room can potentially lead to an increased number of interruptions (Brixey, 2005).

The University of Texas Health Science Center did research to develop a taxonomy of interruptions in healthcare services (Brixey, 2004). They categorized interruptions in terms of who was interrupted, how they were interrupted, the initiator, frequency of interruption, context/location, environment, outcome, and management techniques. The study’s purpose was to provide a taxonomy of interruptions to the healthcare field since interruptions are prevalent in this area (Brixey, 2004).

Industrial engineering techniques have also been recognized as a source for improvement in healthcare. One study implemented lean manufacturing techniques to benefit the healthcare field (Sobek, 2003). There are many inefficiencies and places where waste could be reduced in the system. Interruptions are regarded as “waste” because they force the system to not run at an ideal state. Their research states that if interruptions were excluded from the system, the process will improve because there would be a more standardized path for the information to flow (Sobek, 2003).

Industrial engineering also embraces ergonomic methods to deal with the mental aspect of interruptions. There are some studies that look at the cognitive effects that interruptions have on people’s performance levels. One study looked directly at the effect of interruptions on a task versus the length of time it takes to complete the task (Eyrolle, 2000). The results showed that if the task was interrupted the mean processing time was significantly higher than if the task was not interrupted (Eyrolle, 2000).

Another study examined the effect interruptions and distractions have on the error rate of the interrupted task (Flynn, 1999). When a person is performing a task is interrupted, it is not possible for the same amount of resources to be allocated to the first task (Wickens, 2000). This specific study concluded that interruptions and distractions were correlated with dispensing errors in a pharmacy (Flynn, 1999).

Methods

Study Design

Observers will stand in the pharmacy recording the time and duration of interruptions and distractions. A stopwatch will be used to measure the time. Observation periods lasted anywhere from one hour to eight hours. The observations occurred during (6) separate time intervals for a total of 1094 minutes. One or two observers were present during each of the time periods. The pharmacists and technicians on duty during those times agreed to be participants in the project. The observer will stand close to the pharmacist or technician during the interruption to determine its’ root cause. If the observer is unable to determine the cause of the interruption, she will ask the pharmacist/technician for a brief summary of their conversation or action.

Setting

Observations were made in the central pharmacy located in the University Hospital, which is part of the University of Missouri Health System. This 274 bed hospital treats more than 25,000 emergency room patients per year (University Hospital).

Data Analysis

The duration and type of interruption or distraction is immediately recorded into an excel spreadsheet. The data was then recorded into Minitab to acquire further statistical analysis.

Results

The results of the project validate the existence of an abundant amount of interruptions and distractions occurring in the pharmacy. During the observed time period of 1094 minutes, a total of 528 interruptions and distractions were observed and recorded. This equates to an average of about one interruption every two minutes. See Figure 1 for a summary of the results.
Discussion

The classification of the type of telephone interruptions broke down into eight sections: Clarifying Medications, transfer calls, missing medication, confirm orders, check up orders, change medication, personal, and hurry up calls. Figure 2 graphically represents the type of telephone interruptions that came into the pharmacy.

Phone calls were placed in the clarifying medication category if either one of the two following conditions took place. Either a nurse or doctor would call the pharmacy to ask if a certain prescription is the correct medication and/or dosage to prescribe for the patient, or if the pharmacist needed to call the nurse because the handwriting was illegible so clarification was in order to know what the prescription said. The calls in the clarifying medication category accounted for the highest number of calls and the highest average time out of all the categories.

Transfer calls were common, adding up to 64 calls during the observed period. Often times, a pharmacy technician would answer the phone, but the person on the other end would need to speak with a pharmacist. The technician would then need to signal to the requested pharmacist to answer his/her line. Transfer calls often consisted of the shortest phone call interruptions because the nurse or doctor calling would immediately say they needed to speak with a pharmacist. Yet, other times the technician would be interrupted for a longer period of time before they realized a pharmacist was needed to address the phone call.

Missing medication phone calls came from hospital staff wondering where the drugs they ordered were located. It was common that the Pixus machines were not properly loaded so the necessary medication was missing. The nurse would call the pharmacist in order to track down exactly where the prescription was located.

Confirm order calls took on average 27 seconds to complete. The purpose of these calls was to confirm that the pharmacy received the prescription and it is in their computer database. The pharmacist or technician would simply reply that it was received or not received.

<table>
<thead>
<tr>
<th>Type of Interruption</th>
<th>Frequency (Count)</th>
<th>Duration (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarifying Medications</td>
<td>118</td>
<td>100</td>
</tr>
<tr>
<td>Transfer Calls</td>
<td>64</td>
<td>25</td>
</tr>
<tr>
<td>Missing Medication</td>
<td>49</td>
<td>94</td>
</tr>
<tr>
<td>Confirm Orders</td>
<td>114</td>
<td>27</td>
</tr>
<tr>
<td>Check up Orders</td>
<td>49</td>
<td>59</td>
</tr>
<tr>
<td>Change Medication</td>
<td>14</td>
<td>85</td>
</tr>
<tr>
<td>Personal</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>Hurry up Calls</td>
<td>24</td>
<td>43</td>
</tr>
</tbody>
</table>

Figure 1: Interruptions, Frequency, and Duration

Figure 2: Visual for Duration and Frequency of Interruptions
Check-up calls were made to the pharmacy to determine the status of the prescribed medication. For example, if a medication was overdue to a hospital wing, that nurse might call to check up if the drug will be arriving soon. Often times, a pharmacy technician would be on rounds with the medication. This means that the medication has almost arrived at its’ destination. I propose that a system be put in place to track exactly where the medication is at all times. For example, if the prescription has been filled but is sitting in pharmacy, the nurse who is inquiring about the location of the medication should be able to look on an online database where the medication is sitting. This could be done using bar-coding devices relatively easily.

Changing medication calls were not as frequent, only occurring 14 times during the observation period. Yet, they took on average 85 seconds to complete. When a pharmacist was entering the medication and saw an allergy conflict or wrong dosage, they would need to call the doctor who prescribed the drug. This process was often difficult due to physicians not being readily available for phone calls. The pharmacist would have to move on to a different task and wait until the doctor could call to verify the change in medication.

Personal phone calls only account for 6 calls during the study. The length of the calls ranged from 18 seconds to 201 seconds. There were 24 hurry-up phone calls where doctors or nurses would call the pharmacy to say they needed their medications quickly.

During the observational study, interruptions were frequent and often timely. Research indicates performance levels of the pharmacists decrease when interruptions are present (Brixey, 2004). According to the American Journal of Health Systems Pharmacy, there is a direct correlation between the amount of time wasted by distractions and the amount of time correcting errors (Flynn, 1999). They found as the number of interruptions and distractions per half hour per day increases, the error rate for that time period increases as well (Flynn, 1999). This suggests that the central pharmacy observed for this new study has sub-optimal performance levels due to the constant interruptions.

The prominent interruption in the pharmacy was telephone calls. When an incoming call disrupted a pharmacist, he or she would stop their first task to address the phone call. Thus, two tasks were then being performed simultaneously. Research suggests the primary task performance level decreases as the amount of resources supplied to that task decreases as well (Wickens, 2000). This suggests that there is a larger possibility for error when the pharmacist divides their attention between the phone call and initial task.

Although research has been done to generalize the taxonomy of interruptions, this observational study adds the specific causes of the interruptions along with their duration. Systems that aim to reduce the interruptions in the pharmacy must be informed why the interruptions are occurring, not simply that phone calls are interruptions. By looking at the root-cause of phone calls, such as clarifying medications, pharmacists can focus on reducing this problem. For example, pharmacists often need to phone doctors to clarify their handwriting on the script. If doctors initially wrote legibly on the prescription, there would not be a need for this type of interruption.

**Conclusion**

In order to reduce the number of interruptions and distractions that occur in the pharmacy, a new process flow must be created to address this issue. There are numerous recommendations that can potentially decrease interruptions. First, it is crucial that incoming calls be routed to technicians phones rather than to the pharmacists stations. Since pharmacists are paid more than technicians, the goal should be to first reduce the number of interruptions for pharmacists, then to reduce interruptions for technicians. Using a skills-based routing technique from an Automatic Call Distributor (ACD) program will allow for technicians to receive the calls rather than the pharmacists (Pearce, 2008). Since the calls are routed first to the technicians, the recommendation is to have the call go directly to the technician who has been idle the longest. There is a Least Idle strategy using the ACD that will direct the call to the person who has not been interrupted for the longest amount of time (Pearce, 2008). This implementation will distribute the interruptions among the technicians to verify that one technician is not always being interrupted from their task.

In addition to routing the phone calls to technicians, another recommendation is to have only the phone ring for the person whose turn it is to answer it. Currently, if a phone call comes into the pharmacy, every phone rings on each pharmacist and technician’s desk. This causes a distraction to everyone in the pharmacy, not just the person who answers the telephone. Often, no one answers the phone until it rings multiple times because everyone is busy with a task. In this situation, the phone keeps ringing for every person until someone decides to
answer it. My recommendation of routing a phone call to one specific desk would eliminate distractions to all employees who do not answer the phone because it would not ring on their desk.

Furthering this idea of reducing distractions each time the phone rings, I propose to have each pharmacist or technician who is sitting at a station wear a phone headset. When a call is routed to their phone, the headset will signal to the employee via a beep through the headphones. This option completely eliminates all phones ringing in the pharmacy. During the observational study, it was clear to the observers that the constant ringing of the phone was obnoxious to the pharmacists and technicians. By using the recommendations provided above, this distraction will satisfy the pharmacy employees by reducing the continuous ringing.

Reducing interruptions is imperative because they are considered a cause of human error (Brixey, 2004). This study observed not only the frequency and type of interruption, but also the specific cause (Brixey, 2004). Since clarifying medications is the most frequent type of disruption, the pharmacists should further study how to prevent these interruptions in the future. Interruptions can also be reduced for pharmacists by simply routing the incoming calls to technicians. This will reduce time spent by pharmacists answering easier questions that technicians can address. Further research is required to the recommendations provided in this study.

Analyzing interruptions is essential in order to reduce errors in the pharmacy. Other industries such as aviation have extensive research on repercussions of disruptions (Latorella, 1998). They found interruptions are directly related to performance levels. Aviation is a field related to Healthcare in that mistakes could be life-threatening. This warrants the need for additional research to develop healthcare systems that reduce interruptions. This observational study provides a solid base for future work by supplying data on specific types, causes, and duration of interruptions in a central hospital.

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Biographical Sketch

The author of the paper is Julie Silver, an undergraduate researcher at the University of Missouri-Columbia. The University is located in Columbia, MO. She is co-enrolled in the Industrial and Manufacturing Systems Engineering program along with the Mathematics Bachelors of Science Degree program. Julie is a member of the Society of Women Engineers along at the University of Missouri. Honors include: Dean’s list, Excellence Award, and Engineering School Scholarships.