1. Introduction

A multidisciplinary team of healthcare professionals provides patient care, with each individual possessing a unique skill set appropriate to his or her assigned duties. For high-quality and safe practice, the team must work synergistically, remain focused, and efficiently communicate. Hospitals rely upon communication across departmental boundaries for effective functioning (O’Daniel and Rosenstein, 2008).

In Prince Sultan Military Medical City (PSMMC), communication between the nursing staff and the pharmacy relies primarily on telephone calls. The pharmacy administration has received many calls from unattended calls, and investigations revealed an enormous volume of calls.

2. Purpose

The aim of this study was to develop solutions to reduce the magnitude of telephone calls to reduce workload for pharmacy and nursing staff.

3. Methodology (Materials and methods)

3.1 Design

A quasi-experiment with pre-post testing.

3.2 Method

The strategies adopted in the improvement project were as follows:

- The task group was formulated from all involved parties to cover all issues related to practice, and it was instructed to ensure that the project fits the purpose, together with the information technology (IT) department to determine the feasibility of the project.
- The data-driven design, key performance indicators (KPIs) and required benchmark data were clearly defined and measured e.g., volume and type of telephone calls.
- The improvement project adopted a six-step continuous improvement approach. Figure 1 illustrates these six steps.

3.3 Data Collection

Systematic analysis of the telephone call communication problem was the foundation of the improvement project. A survey was conducted in PSMMC to measure the volume and type of telephone calls. A data collection form was developed as shown in Figure 2. The telecommunication department provided the details of incoming and outgoing calls for the pharmacy extensions.

3.4 Data analysis

Descriptive statistics were generated using Microsoft Excel 2007. T-test was used to measure the differences prior and post-implementation.

4. Results and Discussion

4.1 Problem Analysis

Telephone call data were obtained from the telecommunication department from 09/02/2015 to 23/02/2015. The data indicated that 3,328 calls were received by the inpatient pharmacy and 1,138 calls were made, with a total of 4,466 calls table 1.

To distinguish the types of received calls, a sample of 296 calls was analyzed according to type. The types of calls were categorized as confirmation of receiving the prescription, follow-up, N discontinuations, missing dose, as needed medications, professional inquiries and others. The number of calls according to their category are presented in table 2.

4.2 Proposed Solution

Many studies have confirmed the benefits of computerized prescriber order entry (CPOE) for minimizing medication errors and enhancing communication among healthcare professionals (Do olan and Bates, 2002; DW et al., 1998; Evans et al., 1998). PSMMC is planning to implement a new health information system (HIS), which includes a CPOE. However, this is a long-term project, and the specified HIS does not include a communication and prescription tracking system. Thus, an IT development project was initiated to address the immediate necessity for pharmacy-nursing bidirectional communication system. The proposed system sends prescriptions, provides online status for prescription progress and documents any communication between the pharmacy and nursing staff. IT solutions can significantly enhance teamwork among clinical professionals by improving information transfer, workflow, and communication, resulting in marked improvements in patient safety and overall the quality of care (Doolan and Bates, 2002; Meadows and Chalien, 2003; O’Daniel and Rosenstein, 2008).

4.3 Paper-based Prototyping

The third step in system development was developing paper-based communication forms to be used as prototypes for the communication and tracking program, as well as to be used as a temporary solution until the program implementation is completed, as shown in Figure 3 and Figure 4. The paper-based communication forms underwent many changes based on the feedback of nurses and pharmacists.

From the problem analysis and paper-based prototyping steps, the multi-department task group specified the following requirements for the new IT system:

- The software must be web-based.
- It should be able to recognize the patient’s-bar coded label to minimize the amount of data entry by nurses.
- No extra resources should be required to update and maintain.
- It should document the communication between pharmacies and nursing staff. The documents should include the subject, time, personal details and the required action(s).
- It should send online messages to nurses when the pharmacy is requesting any information or action(s) in regard to patients and vice versa.
- Ability to review prior messages sent to other user.
- Capacity to generate reports about workload, turn-around time (TAT), and workflow.
- At the same time, with all new PSMMC HIS modules, including CPOE, pharmacy system and the electronic medication administration record (eMAR).

4.4 Stand-alone Portals

The IT department developed computer-based systems to automate the paper forms, initially as two stand-alone systems accessed through web portals: one for the pharmacy (Pharmacat) and one for the nurses (Nural).

4.5 Integrated Systems

The pharmacy receives many types of prescriptions, such as STAT, as soon as possible (ASAP) and routine prescriptions. The integrated system provides the platform for managed communication between the pharmacy and nurses. Figure 5 shows the pharmacist screen lists the patient sorted according to their priority color, ready for order yellow for ASAP medications, providing the capability to track all urgent prescriptions. The system includes the patient information screen, which allows the pharmacist to access to the patient’s laboratory results, attributes, allergies, drug profiles, previous discharge summaries and inpatient records.

The pharmacy nursing communication form has been transferred into an electronic form as shown in in Figure 6. The screen is used to send the communication from the pharmacy to the nursing station. In the nursing interfacing screen Nural, Figure 7 demonstrates the nursing pharmacy communication form where the nurse can select the scanned prescription and indicate the urgency of the prescription and nurse comments. The Nural contains a dashboard to list all pharmacy requests. If the nurse needs to know the status of the request, the nurse can click on the request, and then a pop-up window will show the request status, as shown in Figure 8.

Post-Implementation Analysis

After roll-out of the integrated system, the telecommunication department provided data for telephone calls from 09/10/2015 to 20/10/2015. These data were recorded and analyzed. The number of calls (P.value < 0.01) in the received calls table 2. To measure the impact of the system on the types of received calls, a sample of 300 calls was analyzed.

4.6 Continuous Improvement

During implementation, the project encountered situations that needed enhancements.

5 Conclusions

Telephone interruptions during medication handling are considered a significant factor causing medication error, as well increasing workload and TAT. On a regular basis, the inpatient pharmacy receives a large number of telephone call inquiries about the status of prescriptions. Processing high prescription volumes in an atmosphere where interruptions are the norm can lead to medication errors. The developed communication software (Pharmacat/Nural) may represent a possible solution to enhance communication among the pharmacy, nursing and other healthcare professionals. The implementation of Pharmacat/Nural, with the new eMAR and prescriptions, can provide an online status of prescription progress and advance communication between the pharmacy and nursing staff, was confirmed. The number of telephone calls to the pharmacy was reduced and the types of calls shifted to more professional inquiries.

6 Conflict of Interest

The authors have reported no conflict of interest.