

Using an integrated information system to reduce interruptions and the number of non-relevant contacts in the inpatient

pharmacy at tertiary hospital.

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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 patient care, 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 complaints about 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 adapted in the improvement project were as follows: •The task group was formulated from all involved parties to cover all Figure 3: N issues related to practice, and it involved nursing and pharmacy staff to ensure that the project fits the purpose, together with the information technology (IT) department to determine the feasibility of these solutions.

Step1:	Step 2 :	Step 3:	Step 4:	Step 5:	Step 6:
Problem	Proposed	→ Paper based	Stand Alone	Integrated	► Continuous
Analysis	Solution	prototyping	Portal	Systems	Improvement

Figure 1: Project steps.

		Type of call										
Time	Ward	Conf	Follow- up	Time received	Type of Rx (S,A,R)	Refill medications	Missing dose	IV D/C	Professional inquiries	Wrong profiling	Other	Specify
_												
								-				
								2				
_												
_												
								-				
								3				

Figure 2: Data collection form.

To Pharmaoy		Patient Name	
To Pharmacy Ward			
		Bed	
Missing Dose			
NAME & STRENGTH			
Omitted dose			
NAME & STRENGTH			
REASON			
Refill Dose (PRN and Bulk NAME & STRENGTH	items e.g. ointment, ey	e drops, etc)	
Patient Transferred			
Emergency department	WARD/ UNIT	OTH	HERS (SPECIFY)
Others	ne reconciliation form		
please attache th Others	egibly)	For Pharmacy Use	
Others	egibly)	For Pharmacy Use	
Others	egibly) me:	For Pharmacy Use	
Others	rgibly) me: g medications	For Pharmacy Use Pharmacist: Date:	Time:
Others	egibly) me: g medications 1 2 3 4 5 6	For Pharmacy Use Pharmacist: Date: 7 8 9 10 11	Time:
Others	g medications 1 2 3 4 5 6 STAT ASAP	For Pharmacy Use Pharmacist: Date: 0 7 8 9 10 11 Routine	Time: 12 13 14 15 to be included in MAR only

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 solution.

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.

•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 Figure 4: Pharmacy nursing communication. improvement approach. Figure 1 illustrates these six steps. HARMATAL

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 Figure 5: Patient list sorted according to the priority color and outgoing calls for the pharmacy extensions

3.4. Data analysis

Descriptive statistics were generated using Microsoft Excel 2007. Ttest 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.

	er R=Renew M= Modify dose/ fre not applied for Narcotic Medications.		H= Hold RE= Resume	
Nursing ph	armacy c	ommu	nication f	orm
		MILITARY MEDICAL Cl al services department		
	sed when the information needed ached. (It must be attached to the			
Stamped Patient v Allergies Drug nau Dose	or Please write NKA	AOS form Frequency of dosi Duration of treatm Prescriber code Prescriber signatu Other (to be speci	nent	
Top White: Nurse Pir	k Copy: For Pharmacy	Pharmacist: Location: Ext No: Date:	Bleep No: Time: M.S.D. Printing Pres	- (1)

•Ability to review prior messages sent to other user.

•Capacity to generate reports about workload, turn-around time (TAT), and workflow.

•Able to integrate, in time, with all new PSMMC HIS modules, including COPE, 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 (Pharmatal) and one for the nurses (Nurtal).

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 coding, red for STAT and 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 requests.

The pharmacy nursing communication form has been transferred into an electronic form as shown in in Figure 6. This screen is used to send the communication from the pharmacy to the nursing station. In the nursing interfacing screen Nurtal, Figure 7 demonstrates the nursing/pharmacy screen the nurse can select the scanned prescription and indicate the urgency of the prescription and nurse comments. The Nurtal 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 screen will show the request status, as shown in Figure 8.



coding, with red for STAT and yellow for ASAP medications.

	MR# Patient Name Age Admit Date	0016 IBK 30 /2015	Gender Date Of Birth Bed Ward	MALE 22/0 02 T			
In-Patient Medication Request	In-Patient Medication Request List(51)	Lab Result (270) Attribute (0)	Patient Alergies (1)	Patient edication (28)	Patient Discharge Summary (0)	Nurse Communication	
ference No ctor Code ctor Bleep ient File	20153048 1053 Rejection Remarks		Doctor Name Patient weight	(Kn)	IBRAR SYED 2	AHEER	^
ITEM NO	Please provide us w	ith the information in		Pharmacist: M0	DHAMN		
1	Stamped Add Frequency of Drug Name Prescriber Si	f dosing Allergies Prescribe	or Please write NKA er Code	 Patient Weig Duration of T Dose Other 			
	Submit	Cancel					

Figure 6: The electronic pharmacy nursing communication form.

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, IV discontinuations, missing dose, as needed medications, professional inquiries and other. 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 (COPE) for minimizing medication errors and enhancing communication among healthcare professionals (Doolan 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 COPE. 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 a 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 Chaiken, 2003; O'Daniel and Rosenstein, 2008).

Table 1: Analysis of the types of telephone calls received from the nursing staff in PSMMC prior and after the

Nurse	Portal						
					Enter MRN : Bearth	R	۹.
NR# Patient Name Admission Date	00153 00711, HOHAMHED ANNED //2015		Date of Birth Age Bed	01/01/19 Years 02	Elipbilty Gender Room	02 MALE 38	
Nursing/pharmacy Communication Form	Nursing/pharmacy Communication List (1)	Radiology Report (12)	Lab Result (215)	Message: Alen from Pharmacy (0)	Patrent Attribute (0)	Patient Altergies (1)	Blood Bank (D)
eference # Nator Code * Nator Bleep Prescription Item	20100			Height Weight	Of KG		
TTEM NO	TYPE	ROUTE			COMMENT		

Figure 7: Nursing pharmacy communication screen where the nurse selects the urgency, route and writes comments.

Ward:				*				Enter	MRN : Search		۹.
Patient Li	st (12)		War	d Requested Medication	(29)		Messa	ges / Alert	Sur	gery List	
REF	ERENCE NO	PATNO	NAM	i.		STATUS	CREATED DATE	RECI	EIVED DATE	DISPENSEL) STATUS
			ALZA	HRANE SARAH HAID		Not Send	19/08/2015 08:06				
		001568						cl	ose		
		001568	Order De	tails							
		001534	ITEM NO	ТҮРЕ	ROUTE	STATUS	COMMENTS RE	JECTION REASON			
		0002215	11	New Order	IV Intravenous	Dispensed			1.35:55		
		- 0000215	12	Modify Dose/Frequency	OR Oral	Dispensed			1035-59		
	53114	0300215							2558:57		
		0000218							2:38-32		
		0000215							2:49:25		
		0000218							2/19/26		
		0000215							0/29/25		
		0000219816		LAAN, FATMA SALIM		Send					

Figure 8: The pop-up screen that shows the request status.

Table 2: Analysis of telephone call duration (minutes) prior and after implementation.

	Num		
Туре	Before	After	P value
Confirmation	40	9	< 0.001
Follow-up	112	56	< 0.001
IV discontinuations	1	6	0.02
Missing dose	14	19	0.2
PRN medications	13	19	0.05
Professional inquiries	21	116	< 0.001
Other	79	62	0.03
(Blank)	16	13	
Grand Total	296	300	

Post-implementation Analysis

After roll out of the integrated system, the telecommunication department provided data for telephone calls from 05/10/2015 to 20/10/2015. The results revealed a significant reduction (p < 0.001) in the received calls table 1. To measure the impact of the system on the types of received calls, a sample of 300 calls was analyzed according to type table 2

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 (Pharmatal/Nurtal) may represent a possible solution to enhance communication among the pharmacy, nursing and other healthcare professionals. The implementation of Pharmatal/Nurtal, which can send prescriptions, provide an online status of prescription progress and activate communication between the pharmacy and nursing staff, was successful solution enhance the communication between pharmacy and nurses. By implementing Pharmatal/Nurtal, the number of telephone calls was reduced and the types of calls shifted to more professional inquiries.

implementation project.

	Duration		
Time (HH:MM:SS)	Before	After	P value
Average	00:01:12	00:01:43	< 0.001
Mode	00:00:21	00:00:56	
Standard Deviation	00:01:10	00:01:36	
Minimum	00:00:00	00:00:00	
Maximum	00:22:25	00:26:27	
Sum	17:00:21	04:42:30	< 0.001
Count (Calls)	4,465	2,630	< 0.001

6 Conflict of interest

The authors have reported no conflict of interest.

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