Review Article

Barriers to Hospital Pharmacy Information System – An emerging concern

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ABSTRACT

Pharmacy plays an important role in keeping up with the clinical care of patients. In a hospital setting the pharmacies revol ve around medication demands and catering to their everincreasing prices. Such factors cause inefficiencies in the availability of information systems. PubMed and Google scholar databases were studied and extracted for getting information on the technology used in pharmacies. Ongoing vendor involvement, acknowledgement of technology limitations, and attempts to address them were crucial in overcoming technology barriers. This review aims to provide the importance of information systems and implement them across various hospitals.

Key words: Hospital Pharmacy, Pharmacy, Information system, Healthcare.

The concept of pharmacy travels back to the ancient times of the Greeks and the Egyptians. The pharmacy was once a part of medicine but later it separated as a different functional unit with a unique service. One of the major drawbacks in the antique era is the absence or underdeveloped stage of computerized sophistication and systematic handling of data. With the fast pacing health technology, it is high time that the health sector also progresses at the same speed [1]. There is an unsatisfactory performance in the health sector technology in both cost and quality. Healthcare informatics is constantly working on improving itself along with a specific focus on technologies. In this review, we are focusing on healthcare informatics which is defined by HIMSS as "The scientific field that focuses on medication-related data and knowledge within the continuum of healthcare systems—including its acquisition, storage, analysis, use, and dissemination—in the delivery of optimal medication-related patient care and health outcomes." [2].

Pharmacy plays a major role in hospitals. The review particularly focuses on acute hospital pharmacy in central care. In acute hospitals, every admitted person receives at least one dose of medication while a majority of the patients are prescribed from five to nine dosage forms some patients receive up to thirty dosage forms. Frank et al performed a cross-sectional study on pharmacy, this study proved how polypharmacy has increased from the year 1997 to 2021 [3].

As the number of prescriptions increased in the year the concern of improper diagnosis and improper treatment has also increased. By the year 2007, the number of excessive prescriptions decreased in comparison to the year 1997 after controlling the prescriptions through informatics. A recent Irish study performed by O'Sullivan et al revealed that around 84.5 % of the patients had polypharmacy while the rest 43% had a prescription of more than 10 medications that are super-polypharmacy [4].

This showed the number of complex medications administered by patients. The budget of a hospital is more than 300 million per annum. In a 2014 study, 1.8 billion Irish healthcare was spent on medications. These high costs of healthcare prove the need for information systems in healthcare. Powsey et al conducted a study that demonstrated that information systems can play a major role in simplifying patient data [5]. Patient safety has become an emerging concern in media during recent years. Patient injuries are most commonly due to adverse drug events.

Many of these are caused by medication errors which are preventable. They can occur at any stage of the medication use process including ordering, transcribing, dispensing, administering, and monitoring. Most of the solutions to medication errors, such as computerized physician order entry systems, have focused on reducing errors at the medication ordering stage [6]. This reduces the stress on clinical pharmacists for processing paper and gives a satisfactory performance by the information system.

Therefore we are taking a closer look at information systems that aid in improving the effectiveness across all the sectors along with the healthcare sector. Before we implement information systems in healthcare let us look at

the barriers present in healthcare. This review article focuses on various barriers in hospital pharmacy information systems.

Case Studies

We present three case studies given by Noel Carroll et al [7] in their research paper. Two case studies were presented in public hospitals one case study was presented in a private hospital

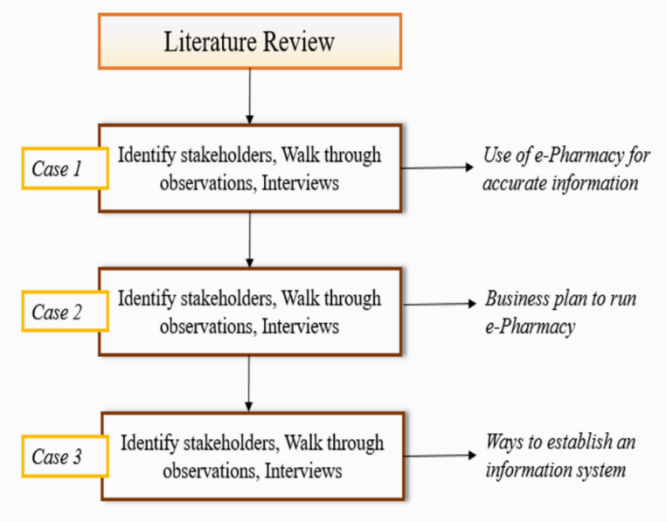

Fig 1- Overview of the case studies 1, 2 and 3

Case Study 1

This case study was managed by the Irish Government health service executive (HSE). This hospital included various healthcare branches like urology, oncology, cardiology, etc. The pharmacist provided direct care to all the branches. The Doctors went on various rounds for all the patients to provide care and improvement in the medications. The hospital system did not have an epharmacy. Despite lacking e-Pharmacy services in the hospital the hospital recognized how e-Pharmacy could improve patient health care. As there were various patients included in this case student the use of e-Pharmacy could give accurate information and medications for each patient.

Case Study 2

This study was also managed by the Irish Government HSE. This case study is presented in an acute care hospital along with a 24-hour emergency department. Similar to case study 1, the pharmacy provided medications for all patients and doctors went for rounds to check on patients and improve their medications. This hospital recognized the importance of e-Pharmacy and implemented a business plan to run the e-Pharmacy. Later this plan remained unexecuted.

Case Study 3

This case study was presented in a private hospital. The private hospital had medical and surgical care for various specialities. The doctors provided advanced surgical and radiotherapy safekeeping for patients. The doctors were also supported with modernized technology. The Pharmacy department purchased, stored, formulated, and compounded all the required medications. The clinical pharmacists regularly monitored and reviewed the prescriptions of patients. They also provided medical counselling for community pharmacists to ensure the safety and efficacy of the pharmacy. The private hospital discussed how they were interested in the information system for pharmacy. Figure 1 represents the overview of these case studies.

Nelson et al outlined various techniques such as using the writing locations, key themes, and verification of stakeholders in the pharmacy and larger hospital staff. A total of four visits were observed which were followed by interviews of the staff members. A total walkthrough of the hospital pharmacy was done which led to an interaction with the key staff which included pharmacists, nurses, and clinical pharmacists delivering services. The Pharmacy is comprised of six to eight members. A snapshot of the pharmacist was taken regularly. Questions about various Pharmacy processes and sub-process were also asked. The observation of staff interaction was done and how patients were administered medications.

Data analysis was performed with coding techniques. Initial first open coding determined themes of transcripts. Open coding was followed by axial coding which determined the categories or subcategories. The relationship between the two codings was determined. The approval of ethics was performed for these studies through HSE.

Alissa et al conducted one study to determine challenges in the Pharmacy electronic information system. The interview was done from October 2007 to March 2008. Semi-structured interviews were conducted in this process to illustrate how the positive and negative impacts of information technology affect the work of pharmacy on healthcare workers. The employee interviews were taken at the United States Veterans Affairs Medical Center (VAMC). Both men and women were recruited for the study.

Table 1- It gives an overview of software packages, which are used in coordination with the Electronic information system

Abbreviation	Software	Function	Reference
CP Hemo	Clinical Procedures Hemodialysis	For patients on hemodialysis; intended to transfer patient measurements (e.g. blood pressure) into a computerized patient record system (CPRS) in real-time. Clinical procedures integrate CPRS with the clinical instrument used for dialysis; at the time of this study, CP Hemo was not widely implemented across	[8]

		VAMCs	
CPOE	Computerized Provider Order Entry	Incorporated into CPRS; prescribers can order most medications and some labs	[9]
CPRS	Computerized Patient Record System	A component of VistA; graphical user interface for some aspects of DHCP/VistA framework; contains patient records, CPOE functionality, lab results, alerts, progress notes, reports and reminders, etc.	[9]
DHCP	Decentralized Hospital Computer Program	DOS information framework implemented in VA in 1982, later renamed to VistA; currently used by VA outpatient pharmacists to fill medication orders	[9]
MRMS	Microsoft's Rights Management Services	Provides secure e-mail messaging; can set restrictions on document use: printing, forwarding, editing, etc.; often referred to as 'RMS' but different from than RMS system described below	[10]
PISCES	Python Implementation of the SPKI (Simple Public Key Infrastructure) Certificate Standard	Provides a secure system for VA Software	[10]
RMS	Resource Management System	Used for scheduling patient appointments and is integrated with VistA	[9]
VistA	Veterans Health Information Systems and Technology Architecture	Information technology framework for ~1300 care sites	[11]
VistAWeb	(see VistA)	Used by VAMCs to view remote patient data from other VAs; separate package from CPRS	[11]
VPN	One-VA Virtual Private Network	Allows remote veterans service organizations (i.e. clinics that have partnerships with VA to care for veterans) to access VA systems securely	[11]

These interviews aided in the analysis of the challenging aspects of electronic information systems. During the interviews, the employees highlighted the use of paper for maintaining records and the deficiency in maintaining an electronic information system. Table 1 elaborates the software packages available for use in clinical setting.

DISCUSSION

Our review gives a generalized perspective on Pharmacy. It shows how pharmacy can be improvised and benefit from technology. We have learned that various hospital sites give a better understanding of how healthcare services can work collectively with Pharmacies. The innovation of healthcare information systems gives better access to the hospital and pharmaceutical environment. A hospital pharmacist plays a huge role in a patient's journey in the hospital. Pharmacists deal with a variety of pharmaceutical services. They run different hospital units and deal with prescription drugs, they also give detailed information about the drugs and provide advice to patients, doctors, nurses, or other healthcare providers. Pharmacists prevent errors that can take place in the prescribed medications. Therefore pharmaceutical service is the core of patient care. Our review has shown the improvement of pharmacy through information systems. An information system is fundamental in upgrading healthcare services. The pharmacy providers view their healthcare in an oriented manner. Focusing on the pharmacy service also included laboratory staff, analysts, schedulers, etc. The optimization of information systems in pharmacy alone is not enough the overall optimization of the services is required. They have their greatest impact in organising and making available information, in identifying links between pieces of information, and in doing boring repetitive tasks, including checks for problems. The best medication processes will thus not replace people but will harness the strengths of information technology and allow people to do the things best done by people, such as making complex decisions and communicating with each other [12].

Holler et al explained a study on the role of information systems in Pharmacy improvement [13]. The study explained that information systems interest pharmacists. Computerisation of ordering improves safety in several ways: firstly, all orders are structured, so that they must include a dose, route, and frequency; secondly, they are legible and the orderer can be identified in all instances; thirdly, information can be provided to the orderer during the process; and fourthly, all orders can be checked for a number of problems including allergies, drug interactions, overly high doses, drug-laboratory problems (giving a patient a drug when they have a known biochemical factor that predisposes them to risk), and whether the dose is appropriate for the patient's liver and kidney function [14].

Health information technology poses a potential impact on the safety of the patient. This study conducted by Holler et al., encouraged the use of information technology for improving

patient safety without any errors. In the upcoming future pharmacists will adopt the wider use of technology for drug administration and prescriptions. A study performed by Pinder et al discovered an understanding that even though the clinical pathways have a structured approach for clinical practice the normal human nature to deliver healthcare often leads to errors and undocumented processes differing from organization to organization. Pinder et al also evaluated the variation in patients in clinical care suffering from cataracts [15].

Despite the variations in patients, there were also underlying similarities. This gives an understanding that clinical, patient, and management provide vital clues to the execution of the clinical care pathway. The tools that are now available should eventually be used in all hospitals. Given the potential impact of these technologies, their diffusion has been surprisingly slow. One reason may be the lack of research showing how much of a difference the technologies make. Funding for such research has been relatively limited, and relatively little support has come from the developers of the technologies. Another, more important reason is lack of demand from the healthcare industry. Safety has not been a high priority in medicine, in part because the problem of safety is generally undervalued. One reason for this lack of appreciation is that medical accidents occur in ones and twos rather than in large groups; moreover, many of those involved are ill and elderly. Fortunately, public concern about the issue is substantial, and increasing, and the healthcare industry is beginning to take a more active interest. Therefore the benefit of clinical care helps in examining clinical care pathways and identifying inefficiencies in pharmacy including patient safety and reduction in costs of medicines.

CONCLUSION

In this review article, we gave an overview of the barriers to pharmacy service. We show how pharmacy information systems innovate the pharmacy service. Technology has great potential to reduce medication errors in hospitals. We have re-examined the clinical care pathways along with the inefficiencies present in the pathway. Staff resistance should be addressed through clear communication, identifying champions, emphasizing new information provided by the system, and facilitating collaboration among health professionals. Pharmacy still has to go a long way to establish an information system in its management.

REFERENCES

1. Mettler T, Raptis DA. What constitutes the field of health information systems? Fostering a systematic framework and research agenda. In: Health Informatics Journal. 2012. 10.1177/1460458212452496
2. Sandra V. B. Jardim. The Electronic Health Record and its Contribution to Healthcare Information Systems Interoperability. Procedia Technol. 2013, 9.
3. Moriarty F, Hardy C, Bennett K, et al. Trends and interaction of polypharmacy and potentially inappropriate prescribing in primary care over 15 years in Ireland: A repeated cross-sectional study. BMJ Open. 2015, 5: 10.1136/bmjopen-2015-008656
4. O'Sullivan D, O'Mahony D, O'Connor MN, et al. The impact of a structured pharmacist intervention on the appropriateness of prescribing in older hospitalized patients. Drugs and Aging. 2014, 31: 10.1007/s40266014-0172-6
5. Powsner SM, Wyatt JC, Wright P. Opportunities for and challenges of computerisation. Lancet. 1998, 352: 10.1016/S0140-6736(98)08309-3
6. Nanji KC, Cina J, Patel N, et al. Overcoming Barriers to the Implementation of a Pharmacy Bar Code Scanning System for Medication Dispensing: A Case Study. J Am Med Informatics Assoc. 2009, 16: 10.1197/jamia.M3107
7. Carroll N, Richardson I. Enablers and barriers for hospital pharmacy information systems. Health Informatics J. 2020, 26: 10.1177/1460458219832056
8. Carroll JM, Chin G, Rosson MB, et al. Development of cooperation: Five years of participatory design in the virtual school. Proc Conf Des Interact Syst Process Pract Methods, Tech DIS. 2000.
9. Nemeth C, Nunnally M, O'Connor M, et al. Getting to the point: Developing IT for the sharp end of healthcare. J Biomed Inform. 2005, 38: 10.1016/j.jbi.2004.11.002
10. Saleem JJ, Russ AL, Justice CF, et al. Exploring the persistence of paper with the electronic health record. Int J Med Inform. 2009, 78: 10.1016/j.ijmedinf.2009.04.001
11. Sellen A, Harper R. Paper as an analytic resource for the design of new technologies. In: Conference on Human Factors in Computing Systems - Proceedings. 1997. 10.1145/258549.258780
12. Bates DW. Using information technology to reduce rates of medication errors in hospitals. Br. Med. J. 2000, 320: 10.1136/bmj.320.7237.788
13. Holler J. The Role of Information Technology in Advancing Pharmacy Practice Models to Improve Patient Safety. Pharm. Times. (2013).
14. Bates DW, Teich JM, Lee J, et al. The impact of computerized physician order entry on medication error prevention. J Am Med Informatics Assoc. 1999, 6: 10.1136/jamia.1999.00660313
15. Pinder R, Petchey R, Shaw S, et al. What's in a care pathway? Towards a cultural cartography of the new NHS. Sociol. Heal. Illn. 2005, 27: 10.1111/j.1467-9566.2005.00473.x

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