



Factors influencing pharmacists' intentions to use Pharmacy Information Systems



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ABSTRACT

The Pharmacy Information System (PIS) is a sub-system of the hospital information system, which is designed to assist pharmacists in safely managing the medication process. To maximize the benefits of PIS, it is important to assess its impact on pharmacists' workflow and medication management processes. The PIS was implemented at King Abdulaziz Medical City-Riyadh (KAMC-Riyadh) 15 years ago. However, its impact on the work of pharmacists has not been satisfactorily explored. Our study was conducted at the Pharmaceutical Care Department of KAMC-Riyadh, and the data were collected from the inpatient pharmacist staff through a survey-based questionnaire. The majority of PIS users reported having a favorable experience with the technology, and to most of the items related to functionality.

The present study identified potential key factors; those that are likely to influence pharmacists' personal intentions for using PIS. However, extended use of PIS would require reducing the rate of demotivated users.

1. Introduction

1.1. Background

Advancements in technology have greatly benefited the healthcare industry, for example, the introduction of Computerized Provider Order Entry (CPOE) systems have reduced medication and dispensing errors and preventable side effects [1–3]. Furthermore, combining Clinical Decision Supporting Systems (CDSSs) with CPOE could regulate medication dosing and prevent medication errors and serious drug-drug interactions, thereby providing timely and effective care to the patients [1–3].

However, there is a need to develop, maintain, and assess the new technology so that patient safety is not compromised [4–6]. The study by Franklin et al. [6] showed that there were significant positive effects, including improvement in quality of health care, less time consumption, elimination of redundancy, and reduction in the number of medication errors when there is improvement in communication between pharmacists and clinicians and nurses.

Health care technology has a major role in improving the safety, efficacy, and quality of care [7]. In pharmacy, computer technology has been used for a long time to manage medication and control medical supplies. The Pharmacy Information System (PIS) is a sub-system of the

hospital information system, designed around acute care services, and is useful in implementing many pharmaceutical care models (e.g., outpatient, inpatient, discharge pharmacies, and related services).

In general, PIS helps pharmacists manage medication services, improve financial management, and increase scientific knowledge about therapies and medication utilizations [8]. However, the potential benefits of PIS on patient care are directly related to its impact on communication, outcomes, and medication management process. For instance, the lack of attention to PIS standards by pharmacist societies for drug usage status, side effects of drugs, and drug interactions on behalf of hospitals may lead to divergences [8,9]. Also, like any technological evolution, updating of PIS is required to fulfill the increasing needs of patients and assist pharmacists in providing better services.

Inpatient pharmacy is more complicated than outpatient since it primarily depends upon the communication between patients, service providers, and technicians [10]. Thus, inpatient pharmacy staff are required to communicate with physicians and nurses to ensure the benefits of the system are implemented, such as reducing medication errors and providing high quality patient care [11]. In such cases, the PIS could have additional benefits such as prevention of medication errors, minimization of prescription and dispensing turnaround times, and increasing the evidence-based use of medications [12]. Nevertheless, outpatient pharmacy includes the preparation of medications for home, clinic,

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discharge from inpatient, and sometimes long-term care environments. The Pharmacy Information System can also be used to manage prescription for inpatients and/or outpatients. It assists the pharmacist to view a combination of the inpatient and outpatient orders, thereby providing the ability to view the complete picture of a patient's therapy throughout multiple inpatient stays and outpatient care episodes. PIS's assistance in outpatient order entry, management, and dispensing is documented [12].

To maximize the benefits of PIS, it is important to assess its impact on pharmacists' workflow and medication management processes. Therefore, in this paper we stress emphasis on identifying the potential key factors, which are likely to influence pharmacists' personal intentions for using PIS. PISs also provide support for various activities performed in the pharmacy including inpatient and outpatient order entry, management and dispensing, inventory and purchasing management, clinical monitoring, intervention management, pricing, charging, and billing, and administration of medication. Apart from enhancing the efficiency of clinical work and patient's convenience, a good PMIS enables the health care providers to make sound decisions in the pharmaceutical sector. The PMIS effectively integrates data collection and processing of information that helps the health care staff at all levels of a health care system to make evidence-based decisions to manage pharmaceutical services and pharmaceutical care [12].

However, to maximize the positive effects of PIS, it is important to assess its impact on the workflow of pharmacists. Troiano states the basic functions of PIS, such that it should provide and support the following activities [13]:

- Inpatient order entry and management
- Dispensing outpatient order entry and management
- Dispensing inventory and purchasing management reporting (utilization, workload, and financial)
- Clinical monitoring
- Medication administration
- Connectivity to other systems

Furthermore, Murray et al. explored the effect of the medication prescription program on the pharmacists' work behavior, including entering prescriptions into a computer database [14]. The overall impact of this system included reduction in medication error and improved productivity in the workplace.

PIS influences the pharmacists' tasks, mainly in communication and service outcomes. Additionally, it might affect the pharmacists' attitudes, difficulties, increased blame, and intention to use PIS. Kaplan et al. explained the importance of evaluating the communication and outcomes of any medical information system such as timeliness, completeness, error rates, retrievability, and changes in clinical behaviors [15,16].

Kaplan & Maxwell also indicated that the information systems enhance the job of users [17]. Adoption and implementation of health computer systems positively affect the daily activities of pharmacists. Krobock indicated that the computer systems had altered the role of individual workers and their work behavior [18]. Thus, it is necessary to study the relationship between medical information systems and their individual work. The above considerations indicate the level of importance of PIS, particularly with respect to pharmacists' job performance.

In the present study, the work of Anderson, Aydin, and Kaplan was adopted and modified to explore the factors that influence the intentions of pharmacists to use computer systems like PIS in clinical work settings. Anderson and Kaplan's work was originally designed for laboratory system evaluation. Thus, some changes and modifications were made to accommodate the current practice in pharmacy work, and the validity of the instrument was ensured through a face validity check (reviewed by three pharmacists), and was further confirmed using reliability and other study results. Although a few studies have investigated the factors that influence the use of PIS by pharmacists, this is the first study to evaluate the opinion of pharmacists on PIS in Saudi Arabian healthcare organizations [20].

1.2. Research problem/nature of problem/problem statement

The PIS has been in use at the Ministry of National Guard Health Affairs-Riyadh for the past 15 years. Currently, only the inpatient pharmacy is using the PIS, which contains embedded clinical monitoring features and a clinical decision support system.

However, it is likely to have some limitations that impact the pharmacists' work, which need to be explored. Björkman et al. highlighted the importance of integrating the inpatient and outpatient PIS, which would definitely impact the pharmacists' work, providing quicker access to the medication history of all patients at the point of care, whether dealing with inpatients, outpatients, or emergency patients [21]. However, in order to observe such benefits, the factors and variables influencing the quality of pharmacists' performance under current PIS need to be better understood. Since a different system is used in the outpatient pharmacy, which does not comply with Troiano's definition of PIS; only the inpatient pharmacy was included in this study [13]. The objective of this study therefore, is to identify and explore the impact of current PIS on pharmacists, as stated below.

1.3. Aim of the study (objectives)

This study aims to assess the degree of influence of PIS on pharmacists' personal and inter-professional communication, personal hassles, increased blame, their intention to use PIS, and the factors that influence the pharmacists to use PIS while performing their medication management processes.

2. Method

2.1. Selection and description of participants

2.1.1. Study area/setting

This study was conducted at the Pharmaceutical Care Department in King Abdulaziz Medical City-Riyadh (KAMC-Riyadh) at the Ministry of National Guard (MNG-HA), Riyadh, Saudi Arabia. The data were collected through a questionnaire-based survey.

2.1.2. Study subjects

Since outpatient PIS was not yet installed in the pharmacy, pharmacists from outpatient and discharge pharmacy were excluded. Hence, the study includes only the inpatient pharmacists at the Pharmaceutical Care Department. Also, the official language of the study setting is English. No individual was hired unless he/she passed the English Competency test (scoring at least 70%).

2.1.3. Study setting

MNG-HA was founded in 1960. Its establishment was followed by the establishment of five healthcare cities located in Riyadh, Jeddah, Dammam, Al-Ahsa and Maddinah named King Abdul-Aziz Medical City (KAMC) [14]. The present study was conducted at KAMC-Riyadh, which has a total capacity of 1020 beds in Riyadh, 530 beds in Jeddah, and 312 beds in Al-Ahsa.

HIS was first introduced in 1982 in KAMC-Riyadh and KAMC-Jeddah and was named as the Legacy system (Aldosari 2014) [22]. There were many negative experiences of patients as well as among the health staff while using the Legacy system. The system was usually associated with outdated software, and a computer system that often generated error data. However, a few hospitals are still following the Legacy system for some part of services, such as pharmacy-outpatient service. QCPR was introduced to resolve the issues mentioned above, by upgrade of systems. Hence, in 2004, QCPR system was first introduced in four large hospitals of Riyadh. It was then implemented in two more provincial hospitals at Al-Ahsa and Dammam, and then in 2011 at Jeddah (Aldosari 2012) [23]. Over the past few years, hospitals in Saudi Arabia are implementing EHR systems aimed at secure data transfer, as well as exchange among various

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