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Role of Information Systems in Healthcare

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Abstract

With the rapid advancement in Information and Communication Technology (ICT), many healthcare facilities are making significant investments in these technologies that have been shown to have a positive effect on patient health outcomes, such as lower error rates and increased patient safety as well as time savings for health professionals. Healthcare systems involve the cooperation of multiple healthcare professionals and disciplines. The quality and safety of treatment in such a setting relies heavily on the ability to share information from one device to another, and from one person to another. However, in healthcare environments, information systems that also support a fast and efficient flow of information along healthcare processes are not widely used. Healthcare organizations typically have their own self-developed information systems that do not accept the cooperation of different organizational units. This paper introduces some general trends of design for the Healthcare Information Systems databases. Our focus is on generalizing the ability of the database structure, which is capable of serving many medical specialties, without any comprehension. In this paper, we would focus on exploring existing Information Systems that are used in current times according to the branches of Healthcare Industry. We also would be discussing and critically analyzing each Information Systems based on previous articles and empirical studies.

Introduction

Healthcare practitioners recognized the need for approaches to increase access to health care and encourage the improvement of information systems. Differences in access to healthcare facilities and the effects arising from the patients are huge public health priorities. This is concerning because the integrated and collaborative treatment involves a high level of standardization and sharing of information between physicians and care providers involved in a patient's healthcare that can be shared through information systems. Medical procedures may even become impossible to carry out if the information is missing, medical tests may be repeated or prior findings may be ignored, preparations may be omitted or a preparatory procedure postponed (Lenz & Reichert, 2007; Reichert, 2011), and lifesaving information may not be available in emergency care. Its information systems and technologies in particular such as electronic health records (EHRs), decision support, electronic prescription, electronic referral, and other technologies that allow information sharing have been promoted as potential tools for improving the quality, safety, and efficiency of the healthcare system. Given those possible advantages, the full potential of the information system has never been tapped. Delivering good quality care is a complex endeavour that is highly dependent on knowledge and information (Bose, 2003; Rezazadeh et al., 2014). Healthcare organizations usually have their own autonomously developed Information Systems which do not support the collaboration of various organizational units and medical disciplines.

This has led to the fragmentation of patient information across healthcare organizations in proprietary heterogeneous systems. Consequently, sensitive knowledge contained in these applications cannot be reached easily.

The aim of this paper is to review existing healthcare Information Systems, discuss how the knowledge of the IS of healthcare professionals influences their everyday work practices and their interest. We distinguished common types of information systems that are available in the healthcare industry.

Literature Review

Health Management Information System (HMIS)

According to the Oxford Dictionary, “Management Information System” can be defined as “a system that stores information for use by business managers”. Previous researchers also determined the definition that has the same connotation to the definition that was mentioned. Heeks, Mundy, & Salazar (1999) defined “Management Information System” as “a system with a group of persons; a set of manuals and equipment used for selecting, storing, processing and collecting data for better and timely decision-making, and for providing information to different management levels.”

In relating to “Health Management Information System,” Heeks et al. (1999), defined it as “a management and information system that is primarily developed to improve healthcare facilities and organizations' planning, management and decision-making.” This information system is a set of data explicitly designed to assist in healthcare growth, management, planning, and decision-making (Hawkins, 2010) In Malaysian

practice, Dr. Abdollah Salleh (n.d.) defined the purpose of healthcare information system as an information system that facilitates two main groups of activities, functions, and services which are the core business of providing healthcare to clients and managing hospitals as a business entity that act as a provider of hospitality services and physical facility. On the other hand, Bush, Lederer, Li, Palmisano & Rao (2009), mentioned that its purpose is to offer all levels of health monitoring of hospitals and managers with accurate, up-to-date, and usable real-time health information.

The important use for HMIS is to evaluate recipients' attitude and satisfaction level, scheduling, implementing, and administering programs' health services and quantifying medical and psychological issues that can be used to compare health services locally, nationally, and internationally (Doolin, 2004).

HMIS consist of a few types of information system which are available and accessible for healthcare practitioners. The types of HMIS are Electronic Medical Record (EMR), Practice Management Software, Master Patient Index, Patient Portals, Remote Patient Monitoring, and Clinical Decision Support. Hence, this paper will explore deeper of five out of these six types of information systems.

Based on Selvaraju's (2006) findings, the researcher appropriately laid out challenges that could be future research in HMIS towards the Malaysia context. It is listed as follows.

Data Quality, Accuracy, and Timeliness: Currently, the health information required is not adequate, timely, and effective for efficient management. Since the data collected are developed over an annual system, it thus brings a concern of data time gaps that should be recorded daily. Standardization of data should be established to reduce the variance of data from the public and private sectors.

ICT in Healthcare: On-paper records and less use of database potential are issues that should be tackled. There are rooms for improvements in incorporating ICT and healthcare to improve customers' satisfaction and value-added business functions in the healthcare industry. In an effort to be data-driven, information flows within the industry should be accessible with the support of ICT leverages.

Evidence-Based Planning/Practice: This practice can be done with the use of National Data Sets that allows comparisons. However, in the current settings, it is unable to be achieved as the formulation of data sets for specific diseases or conditions through data drive consensus should be improved.

Medical Informatics: As data are envisioned to be accessible and shared the Malaysian Health Informatics Association provided the platform to make it do. However, there should be high participation from the private sector and industry partners to make the platform used to its full potential.

Resources: Highly skilled and competent IT personnel should be acquired in developing, implementing, maintaining, and evaluating the IT infrastructure in health informatics. However, Malaysia still has a long way to go to leverage in high skilled IT personnel where the IT infrastructure should be addressed first.

Types of Health Management Information System

Types	Definition	Objective		Advantages		Disadvantages
Electronic	An interactive device	Used to	1.	Enable real-time,	1.	Control of privacy
Medical	health reports	efficiently		patient-centric records		and security of
Record	consisting of	monitor,		available for users to		data.
(EMR)	systematic	access and		approved instantly	2.	Technological
	gathering of	update patients		and securely.		Backwardness.
	patient and	data.	2.	Make evidence-based	3.	High amount of
	population			resources accessible		monetary leverages
	electronic-			for the clinician to make		needed to support
	stored health			decisions about the		the Information
	details in a			patients' treatment.		System.
	digital format		3.	Enables medical		
				professionals to enter		
				new patients records,		
				produce digital record		
				and update records.		
Practice	A software that	Designed to	1.	Automation of	1.	Need a cooperative

Management	capable of entering	help medical		administrative records		and engaging
Software	and track patients,	offices, clinics		for patients' insurance		relationship
	recording	or hospitals to		card.		between medical
	demographics,	run daily	2. Saves time on billing			offices and
	scheduling	operations		department to		insurance
	appointments,	efficiently.		resubmitting		companies.
	managing charge			insurance claims and	2.	Data security
	capture,			boost cash flows by		governance as data
	submitting			faster reimbursement		could be uploaded
	insurance claim,			process.		into outsourced
	processing		3.	Medical practitioners		Cloud databases.
	payments and			able to validate	3.	Need to leverage
	generating			procedures with		into administrators
	reports.			insurance companies		training to
				before ordering it and		equipped the
				reducing errors.		technical skills of
						the software.

Digital	A method of	Capture data	1.	Improve data	1.	Requires mobile
Contact	contact tracing	on cases and		management		phones that
Tracing	that uses	contacts that		efficiency,		supports the
	communication	exposed to the		accuracy and		application to be
	traces in a	risks of		automate tasks		installed.
	communication	pandemic.	2.	Reduce burden data	2.	Privacy threat to
	network. Often			collection on public		users as
	created in an			service workers of		government have
	application that			electronic allowance		the ability to trace
	can be installed in			reporting itself by event		citizens' location
	mobile phones.			and all the contacts.		on the grid.
			3.	Enable place to use	3.	There would be a
				identifying details		probability of false
				contacts with culture		positive alerts to
				unknown for that case		non-exposed
				to discover likely		individuals in the
				exposition.		area.
Remote	A telehealth	To collect data	1.	Allow telecommutin g	1.	Different accuracy
Patient	information	in detecting		information		and reliability
Monitoring	system that	medical events		transmission from		outcome will
(RPM)	provides	or to be used		medical		hinder the

	medical			practitioners		
	sensors to	as part of		that are halfway		information system
	transmit patients	research		around the world.		outcome.
	data to healthcare	projector	2.	Able to detect medical	2.	Need a stable
	professionals.	health study.		events that acquire		connectivity
				immediate and		infrastructure to
				aggressive medical		monitor remote
				intervention.		patients.
			3. Able to give		3.	High cost incurred
				areas patients access		in leveraging to
				to face-to-face health		smart system in
				care.		patients' residential
						area.

Clinical	An information	Assist	1.	Increased quality of	1.	The outcome of
Decision	system that	hospitals,		care and improved		decision making
Support	encompasses	clinicsor		health outcomes.		would be perceived
(CDS)	variety of tools to	medical	2.	Minimizing errors and		as inflexible.
	enhance decision	providers to		adverse events.	2.	Time-consuming

	making in clinical	make well	3.	Improved efficiency		use in making
	workflow.	informed		and provider-patients		decision for
		decisions.		satisfaction.		uncertain medical
						diseases or
						conditions that
						does not have any
						historical data.
					3.	Computer
						application has
						different
						acceptance and
						judgements
						towards a medical
						diseases or
						conditions.

Discussion

From knowing the types of information systems that reinforce HMIS, it is clearly evident that each information system has its own strength and weaknesses. With that, we would like to suggest some improvements to each information system.

Firstly, most of the information systems have the same challenge, which is data privacy and security. It is important that patients are able to feel secure with the data that they hand over to the medical office or hospitals. With that, it would be advantageous if the medical offices or hospitals to expand their IT infrastructure to establish an internal database that has a lower dependency on outsourced databases. This could provide a higher authority to the medical offices or hospitals in

regulating and overseeing the users of data that have access to the data.

Secondly, it is a huge challenge for this technology to be cheaply available. It is a disadvantage for medical offices or hospitals that unable to leverage for costly technologies that help to swift up the processes. Hence, it would be reasonable if these technology manufacturers are able to make it affordable for it to be accessible to all medical offices and hospitals.

Thirdly, accountability in all HMIS used. HMIS brings in logins. Logins are like individual keys, with alphanumeric and special characters as their key. A person logs in with access controls is provided to any employee who will work on HMIS. Every task only happens via logins. HMIS offers the kind of consistency that manual processes cannot succeed in providing. HMIS should have access rights, will anyone be able to access the data, ensuring data safety. Through an audit trail, HMIS enables to trace all activities to the employee who performed using the HMIS in the healthcare industries.

Fourth, avoid outdated data in using HMIS. This is due to HMIS processes being automated, and a lot of tasks are allocated to the software to be performed with high accuracy, with minimal human intervention, the scope of error can significantly be decreased. For example, when an ID patient is billed for consumables used, the bill can hardly go wrong with HMIS because the nurse under the patients enters the consumables immediately into the HMIS, and all information and data should be updated, and tally in the system used also.

Conclusions

In a nutshell, we can see that the healthcare industry is evolving over a period of time. It is the utmost importance to integrate the use of technology and medical practices in order to swift up clinical processes, improving well-informed decision making, and keeping records secure without just depending on on-paper memory. The advancement of technology makes it easier for medical professionals, administrators, and patients. With the emerging needs of fast service delivery and top-notch accuracy in treatments, it is already a focus for medical offices, hospitals, and clinics globally able to execute them in demand of the patients and customers.

In the Malaysian aspect, we can embed these technologies in helping to improve our healthcare industry, as we are in need of real-time data to be shared among the practitioners, administrators, patients, and society at large. During the COVID-19 outbreak, we now acknowledge the importance of real-time data and updates in regards to the healthcare industry of combating against the pandemic. The upgrade of technology uses and infrastructure in the Malaysian healthcare industry should be the focal point of governmental investment during these unprecedented times. With that, we would like to see these information systems are widely used in Malaysian medical offices, hospitals, and clinics nationwide.

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