

An Integrated Model to Share Patient Health Records in Public and Private Hospitals in South Africa

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ABSTRACT This paper investigated how patient health information is transferred and shared between government owned hospitals and private hospitals in South Africa. A case study approach was used. Participants were selected from a population group of doctors. Ten doctors were selected from five government and five private hospitals for interviews. Data was collected using semi-structured open ended interview questions. Doctors were asked to tell in their own words how patient data are stored, managed and transmitted when patients move from one government hospital to another government hospital as well as from one government hospital to a private hospital and vice versa. The findings revealed that Patient health information created in government or private hospital are stored, managed and transmitted in paper or electronic form exclusively within that hospital. No patient data is shared between the government and government hospital or between government and private hospital. The results led to the recommendation of integrated electronic health record model to assist doctors share patient information between private and government hospitals.

INTRODUCTION

The Human Immunodeficiency Virus Infection / Acquired Immunodeficiency Syndrome (HIV/AIDS) pandemic in most African countries has not only caused considerable strain on various national healthcare systems, but has also increased the number of orphans, reduced productive human capital and productivity, eroded knowledge and skills, put pressure on national budgets, increased the poverty-stricken populace and reduced the quality of life, health and wellness (Botswana Government 2003). However, there is a great potential in using Electronic Health Record (EHR) as one of the supportive systems within the healthcare system to address the pressing challenges facing healthcare systems in developing countries. Patients moving from one hospital to another without moving with their paper file, will alleviate some of the challenges facing health care system in Africa. The recognition of EHR in healthcare is not an end unto itself but a means to an end. The recognition of EHR in healthcare is not an end unto itself but a means to an end. A number of developed countries, such as Sweden, Denmark and Australia have implemented some form of EHR (Taylor and Leitman 2002; Terry 2004), although the type and extent of the developed EHR systems differ from country to country (Watson 2006). In essence, EHR is a repository of information regarding the health status of a patient or consumer in computer

processable form (ISO Technical Report 2007). Again it is defined by the IOM (1999) as the set of components that form the mechanism by which patient records are created, stored, retrieved, and used. It is usually located within a healthcare provider setting. This includes data, rules and procedures for processing and storing the information. This early definition from IOM (1999) has a narrow coverage and does not elaborate on core activities and supportive functionalities, which reflects a modern healthcare practice. A more comprehensive definition given by IOM (2003) defines an EHR system as:

- A longitudinal collection of e-health information for and about persons, where health information is defined as information pertaining to the health of an individual or healthcare provided to an individual;
- Immediate electronic access to person-and population-level information by authorized, and only authorized, users;
- Provision of knowledge and decision-support that enhance the quality, safety, and efficiency of patient healthcare; and
- Support of efficient processes for healthcare delivery.

Having stated the definitions for EHR, this research paper focuses on patient health and healthcare records created, stored and retrieved in electronic format for use by healthcare practitioners.

In South Africa, health institutions (hospitals) are categorized into two main groups: public (government) owned hospitals and private owned hospital. Government owned hospitals are those hospitals that are managed and run by the state. They are public hospitals. On the other hand, private owned hospitals are those managed and run by individuals or group of individuals. Patients who go to government hospitals have their health information kept exclusively in the government hospital database and in the same vain patients who go to private hospitals have their health data stored and used in that particular hospital. Patients moving from government hospital to private hospital and vice versa have no means by which their health records (either electronic or paper base) can be transferred between a government and private owned hospitals or vice versa. The question is how can a common ICT platform be created to facilitate sharing of patient health information between government and private owned hospitals in South Africa?

Objectives

The objective of this research therefore, is to investigate the different methods by which patient records are stored, processed and transferred between government and private hospitals in South Africa and based on the findings proposed a common EHR platform through which patient health records can be shared between these two categories of hospitals in South Africa.

Theoretical Framework

This research paper is underpinned by the theoretical framework “activity theory”. Activity Theory is a theoretical framework for the analysis and understanding of human interaction through their use of tools and artifacts. It is based on the idea that activity is primary, that doing precedes thinking, that goals, images, cognitive models, intentions, and abstract notions like “definition” and “determinant” grow out of people doing things” (Morf and Weber 2000). Activity Theory uses the whole work activity as the unit of analysis, where the activity is broken into the analytical components of subject, tool and object, where the subject is the person being studied, the object is the intended

activity, and the tool is the mediating device by which the action is executed (Hasan 1998). Engestrom’s (2001) modification of Vygostky’s original activity theory provides for two additional units of analysis, which have an implicit effect on work activities. The first is rules, these are sets of conditions that help to determine how and why individuals may act, and are a result of social conditioning. The second is division of labour, this provides for the distribution of actions and operations among a community of workers. These, elements affect a new plane of reality known as community, and through this, groups of activities and teams of workers are anchored, and can be analyzed (Verenikina 2001). A key attribute of Activity Theory which is applicable to this research is its focus on the interaction between people (human) and their mediated tools or artefacts (purpose) which have been shaped by human activity (technical elements). With the usage of the Internet, information systems and computer-based technologies to capture, store and transfer patient information Wartofsky (1979) proposes these tools to mediate human activities in sharing patient information.

Related Work

The essential differences between paper health records and electronic health record, regarding location, readability, accessibility, traceability, supported health care processes and data self-sorting have been identified by main researchers (Bakker 2007; Bates et al. 1995; Kuperman et al. 2001; Allan and Englebright 2000) as the main factors for transferring patient health records from one institution to the other. These researchers indicate the advantages offered by electronic health record (EHR) over paper health records. Among the advantages include; records which are no longer restricted to their original location of establishment. Again data about the health history of patients and their current health status (which may be recorded by multiple healthcare professionals at different locations) can be presented in a coherent and legible way. Secondly, access rules are made explicit to adhere to. Thirdly, the health care process can be supported logistically. Moreover, EHR are available with a 24-hour access, and data is self-sorting (Suomi 2006). All of these qualities of HER improve modern healthcare

practice by providing multiple functions, such as evidence-based healthcare (Overhage et al. 2005) and increasing efficiency in medical practice (Ammenwerth et al. 2004). Unfortunately an actual patient health record or history created in South Africa hospitals resides with individual hospital in a form of hard copy record or soft copy record in a data base which hampers efficient healthcare delivery. It is therefore important to integrate the different health record systems, government and private hospitals to assist with easy transfer of patient information to improve healthcare delivery. The next section elaborates on health system interoperability.

The HL7 EHR (2008) defines interoperability as the prospect of systems communicating with one another and proposes a three part definition for health systems interoperability, which is explained as follows:

- Technical interoperability: This focuses on the physical transmission and receipt of health data and its transport between participating systems;
- Semantic interoperability: This focuses on ensuring shared meaning between sending and receiving partners. This is to ensure that the meaning of what was sent is consistent with the understanding of what was received; and
- Process interoperability: This also focuses on higher-order workflow concepts that make data sharing a richer and more valuable experience. It tries to ensure that shared health data support the specific activities and workflow of the organization.

Arzt (2007) indicates that there are different models of interoperability which an organization can adopt, for example, the Centralized Model, the Co-operative Model and the Distributed Model.

A centralized model utilizes a centralized server where the records of all the patients are registered, matched, and de-duplicated. Data may be collected from various sources behind the scenes, but users may only access a single consolidated application or suite of applications. Due to the fact that the data and the applications are more centralized, data security tends to be more straightforward.

On the other hand a Co-operative Model is a combination of the Centralized and the Distributed Models. It has both a central storage and a mechanism for obtaining data from participat-

ing servers on demand. The advantage of the Co-operative Model is that, data is stored centrally and what remains distributed can be anywhere between 0 and 100 percent of data. This can be adjusted over time as requirements, usage patterns and technology constraints change. The cooperative model allows a flexibility approach where certain categories of frequently needed data can be stored centrally for quick and reliable access from the single store while large data blocks can remain in the originating server for quick release when needed. Depending on where data is stored, the quality of service guarantees can vary, and this often drives the decision of what to store centrally and what to keep distributed. In contrast, in the Centralized Model, data that is not in the central storage and never be available to subsidiary servers. Similarly, in the Distributed Model, no data can be obtained without a real-time request or response from the respective servers

METHODS

The study was carried out in the North West Province of South Africa. Five government hospitals and five private owned hospitals in the North West Province of South Africa were purposefully selected. These hospitals were selected based on their geographical locations which spans across the entire province. The participants for the study were drawn from the population of doctors in the ten hospitals. In describing population Polit and Beck (2008) indicate that it is the aggregate of cases having a common and designated criterion that is accessible as subjects for a study. A purposive sampling technique was used in selecting the participants. A doctor from each of these hospitals was selected. The participants were selected by their professions which was relevant to the study. The ten selected doctors volunteered to participate in the study.

Data was collected using semi-structured open ended interviews. The interviewees represented different roles ranging from specialist doctors to general practitioners. The interviewees were asked to tell in their own words how patient data are stored, managed and transmitted when patient move from one government hospital to another government hospital as well as from one government hospital to a private hospital and vice versa. The interview lasted for

one hour with each interviewee and was audio-recorded and transcribed by the researcher.

Integrity of data entry from the study was checked by another researcher. Transcripts were manually coded using Wolcott (1994) method of case study analysis techniques. After the initial coding, broad categories were identified by searching for patterns in the participants' responses. The categories were storage of patient data, management of patient data and transmission of patient data.

RESULTS

The results are presented taking into consideration the constructs of activity theory (subject being the doctors; the object being activities, storage of patient data, management of patient data and transmission of patient data; and tools being the electronic record or paper record) for both government and private hospitals.

Storage of Patient Data

The findings indicated that doctors' record patient health information on paper and a file is created for each patient in government hospitals. At the end of each working day the files are stored in a cupboard which is in a record room of the hospital. There is no EHR system installed in any of the government hospital that was studied. However, there is a Patient Administration and Billing (PAAB) system in all the government hospitals which is used to support revenue collection and for keeping of patient demographic information. However, it is not used for keeping the patient clinical history. Private hospitals on the other hand, have database system where patient demographic and clinical history is stored. However this data is limited to each department of the private hospital. Furthermore patients' health information is confined to that private hospital alone and cannot be accessed by any other hospital outside the private hospital which generated the data.

Management of Patient Data

Patient demographic information from government hospitals are used by the South African government. Patient health information that is stored in a paper form is used by the health

workers whenever the patient visits the government hospital. The health worker goes to the record room, fetch the patient file and update any new information the patient might have reported. At the end of the working day, the patient file is kept in the records room.

In the private hospitals any new information regarding diagnosis, prescription and medication are recorded on patient electronic health record for storage. Any health worker who performs any medical procedure retrieves the patient information from the hospital's database.

Transmission of Patient Data

Within any of the government hospital, when a patient is referred from one department to another, the patient collects his or her file from the department where he first visited and takes along the file with him to the referred department. In the same way if a patient is referred to another hospital, the patient goes with his file.

In the private hospitals, when a patient is referred to another department in the same hospital, the patient moves to the department without his file. The patient health information is transmitted electronically to the new department because the hospital has a patient database where updated information about the patient health is stored. The entire department in the private hospital is linked to the database.

DISCUSSION

The discussion of this paper is based on the three constructs of activity theory (subject being the doctors; the object being activities, storage of patient data, management of patient data and transmission of patient data; and tools being the electronic record or paper record) for both government and private hospitals.

Storage of Patient Data

Patients file are manually created and stored in a record room in the government hospitals. This storage is manually done. Some information regarding the patient demographics are captured and stored on a PAAB system. Other forms related to patient health information are filled in manually and inserted into the patient file. One respondent indicated: "*We create patient health record by writing in their files. A*

file is compiled when a patient arrives in this hospital and the file contains prescription sheet, case history sheet and referral sheet. Sometimes there are no staples to keep records together". Keeping patient information in a paper base has many disadvantages. One disadvantage as confirmed by Bakker (2007) is that patient health data is generally viewed only at one location where the physical document was produced and accessibility to the data is all or none at any point in time.

A second respondent also indicated that if PAAB or new system can be built to store the patient health information it will be beneficial to the hospital. However, the private hospitals have their centralized system where patient health information is stored. Unfortunately when a patient is transferred from private hospital to government hospital or vice versa, the patient goes without a paper file from either of the hospitals. When EHR system is implemented it will avoid loss of patient health record after many years. Suomi (2006) indicates that electronic health records of patients are available 24-hour for access and can minimize the loss of patient history after many years.

Management of Patient Data

The patient files in government hospitals are hand written and are maintained under locked cabinet. When Patient first come to the hospital they need to have an identity book, referred letter or card. The patient then produces it at the Out Patient department (OPD) where the nursing sister in charge goes to the records room to trace the patient file. This takes about 10 to 15 minutes to trace a single patient's file. The standard procedure is arranging the files alphabetically. A respondent indicated, *"it is difficult to find a file after a long time. It is time consuming because there is no record staff available after hours to help you retrieve a patient file"*.

Transmission of Patient Data

Transfer of patient data within and across government hospitals occurs when patients are referred to another department or doctor. The Australian Standard (2006) defines referral as the communication, with the intention of initiating care transfer, from the provider making

the referral to the receiver. In this study referral means transmitting documents from doctor-to-doctor, doctor-to-practitioners, and doctor-to-other departments within and outside the hospital. Most cases from government hospitals to private hospital patient only go to the referred hospital with letter but there is no patient data available.

On the other hand, private hospitals use their centralized based computer system to store and transfer patient information from one department to the other within the same hospital. According to Ammenwerth et al. (2005) the implementation and integration of EHR in both these two categories of hospital will increase efficiency in medical practice in South Africa.

The Need for Integrated Model to share Electronic Health Records between Private and Public (Government) Hospitals

The prospect of ICT systems in government hospitals and private hospitals talking to each other in a more loosely-couple manner, rather than being absorbed into one another is more feasible strategy for the hospitals in South Africa. For this reason the cooperative model seems most reasonable to allow the hospitals the autonomy and flexibility to take control over their own health data in their environment while at the same time, it enables inter-hospital data integration (Lammer and Germany 2008). Figure 1 illustrates the integration of data in private and government hospitals through the use of service hub.

Service Hub: This is a uniform service integration architecture of infrastructure services that provides consistent support to government and private hospitals across a defined ecosystem (North West Province). The Provincial HER Service Hub is implemented as a SOA architecture using a web service interface. The first set of tasks of the Provincial EHR Service Hub is to identify (authenticate) the user, and to show the service that the user may use and their status. Furthermore, the Hub must be able to route messages to the back-end services and any other hospital linked to the hub. The second function of the Provincial HER Service Hub is to orchestrate the process that the user performs. This is extending the capabilities of the hub to expose functionality to the user.

Integration Services: Integration service is one of the functions the Provincial EHR Ser-

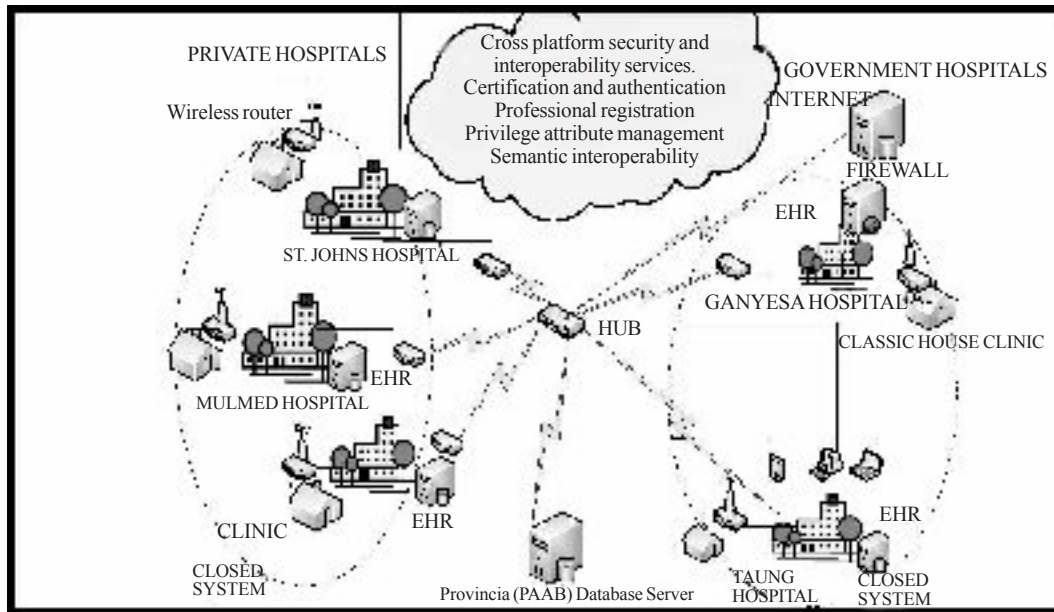


Fig. 1. An integrated model of EHR

vice Hub provides. The hub provides a rich set of integration service which gives connectivity amongst all the participating healthcare systems and stakeholders. The integration services ensure interoperability between connected health systems and services; provide the required network and applicable protocols, message routing and process orchestration, and finally transaction management. These services are offered in a secure, reliable and highly available architecture environment.

Security: The implementation of integrated solutions in the context of the EHR framework must be governed in a secure environment. This means that there should be reliable, secure user identification, authentication and authorization. The issue of security and confidentiality of patient information became evident during the fieldwork and therefore, it is important that such identification measures are put in place. One of the respondents stated that there should be signatures and passwords so that “if something goes wrong we know who did what” Again it was emphasized by the respondents that patient health information is a sensitive issue and must be password protected

Communication: This is concerned with the interaction between components across the different layers. In the communication layer, an

appropriate transport protocol, such as HTTP for Internet communication and TCP for intranet communication are considered for sending messages. All the components of the EHR system communicate through a shared network infrastructure using an agreed service protocol. An HL7 messaging standard has been adopted as the messaging standards for the healthcare sector in South Africa. However, there are plans to move to an XML based standards for messaging requirements. Therefore, the EHR system adopts these national messaging standards

CONCLUSION

Having reviewed the problems associated with sharing of patient health information between government and private owned hospitals and vice versa unpacked the activities that can facilitate the process of integration (storage of patient data, management of patient data and transmission of patient data) it was noted patient health information always resides with the hospital where the data was initially collected. Patient who has been referred from one hospital to the other (government hospital to private hospital) or vice versa has no means of their health record being transferred electronically to the referred hospital. The findings further re-

vealed that patient's health records are not stored electronically in government hospital. However private hospitals do store patient health records in electronic format. The findings lead to the proposal of EHRs in government hospitals and a creation of an integrated model to share Electronic health records between private and public (government) hospitals.

RECOMMENDATIONS

Based on the findings of this paper it is recommended that the services of PAAB system in government (public) hospitals be extended to incorporate Patient health record. Secondly the separated EHR systems found in private hospitals are integrated to the government PAAB systems through the use of a service hub.

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