

# Readiness Assessment for Implementation of Electronic Patient Record in Ghana: A Case of University of Ghana Hospital

Samuel ADJORLOLO<sup>1</sup> and Gunnar ELLINGSEN

*Telemedicine and e-health research group, University of Tromsø, Norway*

**Abstract.** Numerous challenges confronting the health system of developing countries makes implementation and the long term survival of ICT projects non-feasible in so far as there is no pre-determination of institutional readiness for such projects. The current study examined the readiness of University of Ghana hospital towards the implementation of Electronic Patient Record (EPR) using interpretive case study research method. The results of our study indicates some eagerness of the hospital administrators towards ensuring organizational readiness for EPR in the following areas; training of staff in computing, provision of alternate source of electricity, provision of internet and internet infrastructures, provision of EPR. The health workers indicated their readiness for EPR in the following areas; knowledge in and access to computers, motivation for EPR and anticipated changes in work schedules. Despite these somewhat promising readiness indicators from the hospital, there were, however, some conspicuous constraints relating to finance, a functioning ICT Department, ICT logistics and procurement of EPR that must be well addressed for a successful and sustainable EPR implementation

**Keywords.** Developing countries; electronic patient record; Ghana; information infrastructure; readiness assessment.

## 1. Introduction

In recent times, health sectors of most developing countries are experiencing rapid proliferation of and the subsequent adoption and implementation of ICT projects. Some developing countries have started implementing electronic patient record (EPR) which is a particular unit of information technology in the health sector (El Lawindi, El Shafie, & Kamal Elden, 2013; Sood et al., 2008), with the goal of providing efficient healthcare to the populace. Despite the growing interests in the adoption of ICT in healthcare sector in developing countries (Lewis, Synowiec, Lagomarsino, Schweitzer, 2012), evidenced muster over the years on previous projects indicate sustainability problems. Though significant strides have been made over the past decade in promoting health-related ICT project initiatives in developing countries, evidence indicates such initiatives are at their embryonic stages (Lewis et al., 2012). Most projects undertaken in developing countries either do not get commenced or the projects are abrogated in their embryonic stages (Oladosu, Ajala, & Popoola, 2009a). It is also important to note that only a few of these projects have gone beyond the pilot phase and even where this has happened, the projects are usually fragmented and uncoordinated (Lewis et al., 2012).

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<sup>1</sup> Telemedicine and e-health research group, University of Tromsø, Norway. Email: sastod2007@yahoo.com

Numerous challenges such as scarcity of resources, poor telecommunication infrastructure, poor internet connectivity and non-technological issues such as organizational factors, human elements, policy and standards and socio-economic issues (Jennett, Gagnon, & Brandstadt, 2005) have been cited to impact negatively on the adoption of ICT in the health sectors in developing countries (Sood et al., 2008). A decade ago, research has found that large scale information technology projects are associated with 30% or more failure rates (More, 1990), and the problem is far more convoluted and visible in developing countries. Challenges confronting developing countries are not of the same magnitude suggesting that, problems that can hamper the operations of ICT in healthcare industry are not the same for all developing countries. One area in which discussions have been advanced for the purposes of initiating and sustaining health-related ICT projects in the health sectors of developing countries is readiness assessment. The concept of "Readiness" is related to terms such as "innovation" and "adoption" of new technologies and is used to cover many organizational dimensions when implementing large scale information infrastructure (II) such as EPR (Mannan, Murphy & Jones, 2006).

The following research questions were addressed by the study;

- (1) What are the organizational resources and infrastructure available for EPR implementation in developing countries?
- (2) What are the characteristics of the health workers that could determine readiness to use EPR when implemented?

Empirically, we will draw on a work practice from the University of Ghana hospital where we investigate the hospital's readiness towards the implementation of EPR. The objectives of the study were to determine organizational resources and infrastructure and human resources that available for EPR implementation at the University of Ghana hospital.

### **Readiness Assessment and EPR**

Readiness which is an early aspect of change (Lewin, 1951) is defined as the cognitive precursor to the behavior of either resistance to or support for a change effort (Armenakis, Harris & Mossholder, 1993). Readiness in this context involves organizational readiness and health workers readiness. Organizational readiness relates to organizational resources such as finance, ICT department, and ICT infrastructure necessary for EPR implementation. Health workers readiness also relates to current patient record practices in the hospital (e.g. challenges) and readiness for EPR (e.g. knowledge in and access to computer, motivation for EPR and anticipated changes in EPR).

Readiness assessment is particularly relevant for implementing EPR in healthcare institutions. As an information infrastructure, EPR has several characteristics-enabling, shared, open, socio-technical, heterogeneous and installed base (Hanseth & Monteiro, 1998) that makes it unique and whose implementation can appear more challenging. These characteristics make EPR more complex, requiring that its implementation is preceded by readiness assessment to determine success factors. Readiness assessment

is one of the ways of reducing the risk of failures in organizational projects such as EPR (Demiris, Oliver, Porock & Courtney, 2004).

It is imperative to examine the availability, given the local context, of necessary factors that would promote rapid adoption and utilization of EPR. Readiness assessment could help determine the major actors and their respective roles in the design and use of EPR while enabling the sampling of both social and technological characteristics to ensure a balance between social characteristics of users and the technical details of EPR. The necessary social and technical readiness assessments are of much importance for EPR which are mostly capital intensive and whose failures represent a major financial loss to the implementing organization. Readiness assessment provides an avenue to know users profile and readiness as well as organizational strengths and weakness (Weiner, Amick & Lee, 2008).

However, readiness assessment towards the implementation of ICT projects in health sector is often neglected (Touré, Poissant, & Swaine, 2011) for political and other socio-cultural reasons. In most Africa countries where some health-related ICT projects have been implemented, readiness assessment studies are not conducted and even where such studies are conducted, they are not reported to serve as a guide to future implementations. Several developing countries lack certain basic infrastructures and policies for nationwide health-related projects. It therefore becomes particularly pertinent that many health care institutions in developing countries tending to adopt EPR should conduct readiness assessment studies to determine the local and organizational factors needed and available for such initiative so as to facilitate its acceptance, utility and sustainability.

## **2. Methodology**

The study was carried out at the University of Ghana hospital, Accra, Ghana. Established to cater for the health needs of the university community, the hospital has extended its services to neighboring communities. It has 16 wards/departments with over 300 workers.

Interpretative case study approach was used (Klein & Myers 1999). Without any preconceived hypothesis, interpretative research enabled the researchers to gain deeper insight into readiness for implementing EPR, by focusing on human actions and interpretations involving the challenges of paper based record system and the need for an alternative record system.

Two categories of participants were recruited for the study; the health workers and the hospital administrators (Table 1). Ethical approval for the study was sought from Noguchi Memorial Institute for medical Research, University of Ghana, while institutional approval was also obtained from the hospital. The participants were conveniently and purposively selected after agreeing to participate in the study. Appointments were booked with each participant to ensure full cooperation and no/minimal distractions during data collection process. Data collection usually begins with a review of the entire study protocol and obtaining of signatures authorizing

consent for participation. Permission and approval were also sought for audio-tape recording of the data collection process.

**Table1:** Showing the actual number of participants involved in the study

Department/Ward	Actual number of participants
Ward A	4 (3 Nurses, 1 doctor)
Ward B	4 (3 nurses, 1 doctor)
Maternity	6 (4 nurses, 2 doctors)
Children's	4 (3 nurses, 1 doctor)
Laboratory	3 laboratory technicians
Pharmacy	3 pharmacists
Records	4 record workers
Administration	2=1 medical director, 1 administrator
<b>TOTAL</b>	<b>30</b>

Semi-structured interview, observation and document analysis and closed ended questionnaire were the main tools for data collection. The interview process lasted for an average of 60 minutes per participant for a total of 30 participants. Field notes were also taken during the course of the study.

### 2.1. Data analysis

Qualitative data was analyzed based on the approaches suggested by Miles and Huberman (1994), and proceeded manually using matrices (Kagaruki, Kimaro & Mboera, 2013). The session summary sheets, prepared for each interview session, played a significant role in data reduction as it assisted in the assignment of labels to words, phrases, paragraphs; adding comments and reflections; going through the data to identify similar phrases, patterns, themes, relationships, sequences and differences and the elaborations of a small set of generalizations that cover the consistencies discern in the data. SPSS version 18 was used for the analysis of quantitative data involving participants' knowledge in and access to computers, experience with telemedicine and e-health services and other descriptive variables such as percentages.

## 3. Results

### 3.1. Record keeping in the hospital

Record keeping in the hospital as at the time of the study was mostly paper based. Being the busiest, the Record Department is the epicenter of all record keeping in the hospital and serves the purposes of record creation, retrieval and storage. All four (100%) of the workers interviewed at this department expressed dissatisfaction and frustration from the tedious and tiring nature of the work they do.

*“We have to be standing, moving up and down, searching for folders, some you can locate easily, others with much difficulty and at worst, others you can't find them even after spending several productive hours of searching”* (Noted by one of the participants').

All four (100%) of the workers stated it takes a great amount of patience and tolerance to work at the records department. They also stated instances when they have to assume they are foolish just to circumvent any untoward tensions with the patients.

The responses from the participants who work with patient records on the wards also revealed satisfaction as well as dissatisfaction with the paper record system. The satisfactions with the paper record centers on; (1) familiarity with paper, pen and pencil, (2) no formal training needed (3) paper record can be used in the absence of electricity, and (4) signing against procedures in paper record offers legal protection. On the other hand, the dissatisfaction with paper record centers on; (1) incomplete record generation, (2) laxity in adherence to protocols and guidelines, (3) confidentiality and security issues, (4) unavailability of records (missing records etc), (5) fragility and susceptibility of paper record to damage, (6) problem handling large records for some patient categories, (7) limited space for storage especially at the maternity ward, (8) illegible handwriting, and (9) problems with back up of patient records.

### 3.2. Readiness for EPR

#### 3.2.1. EPR facilitating healthcare

All the participants stated that, adopting an electronic version of record keeping in the hospital would facilitate healthcare delivery. While some participants cited some documented evidence of EPR in the literature, others stated the possible benefits of EPR by drawing on how the use of technological devices such as mobile telephony has made life easier and comfortable.

*“Life has been easy with the mobile phone, I can call everywhere and anytime and I also think that, EPR would facilitate healthcare delivery as mobile phones have made life easier and simpler”* (One of the participants noted)

The participants also stated that the short falls in the paper based record may be circumvented by the use of the EPR. In summary, the participants indicated EPR will improve healthcare delivery by facilitating storage, retrieval and sharing of data. They also maintained that with EPR, data gathering is more likely to be persistent and consistent and there would be no need to duplicate patient data in different documents.

*“I am not sure you will need to re-enter patient data after it has been entered by the staff at the record department; am also not sure that with the EPR, we would have to enter records into the admission and discharge book, the ward state and others- all I know is that we can create duplicate of the patient data we entered into the EPR which we can even store for backup purposes”* (one of the participants stated).

### 3.3. Organizational Readiness for EPR

### 3.3.1. Financial capabilities

The availability of fund is one of the significant considerations that must be well addressed for the success of EPR. In the current study, the administrators contended envisaging no financial constraints in seeking for funds from the University.

*“All we need to do is apply for funding from the University”* (stated by one of the administrators).

The administrators further revealed that, any project the hospital intends implementing must be approved by the university before funds could be made available.

### 3.3.2. Training of staff

Health workers knowledge in computing would be pertinent to their attitudes towards EPR, the adoption of EPR and the overall success of EPR in the hospital. In the current study, the administrators identified the importance of computer literacy for the health workers and are committed to making resources available for the purposes of providing computer training. The organization has also taken steps to ensure the health workers have knowledge in computing through the provision of computer training programs- a program attested to by the health workers. The administrators further noted that, despite this training program in computing, on the job training on the actual use of the system (EPR) will be provided.

*“The strategy to be employed is that for each department, one staff would be trained and that person will then serve as EPR teacher who will teach other healthcare workers on that ward”* (Stated by an administrator).

### 3.3.3. Internet and internet facilities

Most of the wards and the departments have internet infrastructure, however, with the exception of ward A, the pharmacy department, the record's department, the cash office and the administrators' offices, no other ward or department has internet connectivity. The administrators pointed out they envision networking all the departments, units and wards before rolling out any major electronic applications for healthcare delivery. Table 2 below summarizes the ICT infrastructure situation of the hospital at the time of data collection.

**Table 2:** ICT Infrastructure in the Hospital

<b>Network/hardware in the hospital</b>	<b>Quantity</b>
Desktops	40
Monitors	40
Printers	5
Document scanner	1 (But not being used)
Photocopier machine	1
Phone (Normal phone)	All the wards
Television	All the wards
TV based video conferencing system	0

PC based video conferencing system	0
Access to internet in the hospital	Yes
Department/s/wards with internet connectivity	5

### 3.3.4. ICT Department

The institutional success of EPR also depends largely on the availability of a well functioning ICT Department. Though the hospital has an ICT department, the state of the department as at the time of the data collection could appropriately be described as “pseudo-ICT department” as it lacks some basic ICT tools and infrastructure. There was one ICT personnel working at the department who also stated he is not overburden with problems in the hospital. The administrators, however, maintained that plans are far advanced to upgrade the status of the ICT department to be able to meet the demands of a “digitalized hospital”.

### 3.3.5. Supply of electricity

In an effort to mitigate the rampant power supply problem in Ghana, the hospital has procured a standby plant (generator) that starts operations in three (3) seconds when the national power supply is disrupted.

*“We have a plant (standby generator) that automatically provides light in 3 seconds when the national electricity supply is either off or is experiencing some challenges. We never had electric power supply as a problem in this hospital” (one administrator noted).*

### 3.3.6. Procurement of EPR

According to the administrators, EPR would be provided by vendor “A” (Name withheld as the deal has not been finalized). They however added that, experts from the vendor will be at the hospital to examine how the current system looks like so that the new system could be designed along that line. The administrators indicated the system designers would probably consult the users (healthcare providers) if the need arises.

### 3.4. Health Workers Readiness

The health workers who would be the users of the EPR stated it can bring enormous help to the way healthcare is organized and delivered.

*“In the world of technology where life has increasingly become simpler, easier and comfortable due to technological advancement, the way healthcare is organized and delivered in this hospital can also experience dramatic change if we digitalize our record system; it is possible that the benefits of the EPR would be overwhelming” (Noted by one of the participants).*

The potential for EPR to accelerate healthcare delivery is well anticipated by the participants in the study.

### 3.4.1. Knowledge in and access to computer

With the exception of the participants from the pharmacy and the record department and the administrators, all other participants indicated they do not use computer or computer with internet connectivity at work. On knowledge in computing, 16 (53.3%) of the participants rated their knowledge as average, 7 (23.3%) rated their knowledge as experienced while 7 (23.3%) also rated their knowledge in computing as novice (Figure 1).

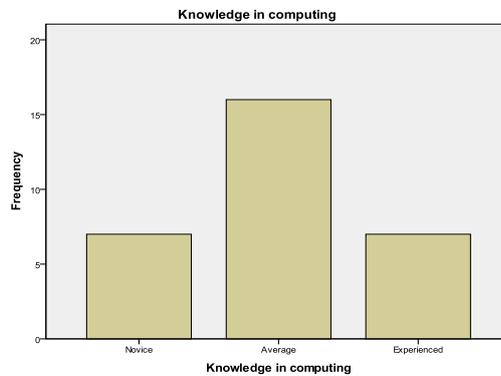


Figure 1: Knowledge in computing

Eighteen (60%) of the participants indicated they have personal computers while the remaining 12 (40%) also indicated they do not have personal computers (Figure 2).

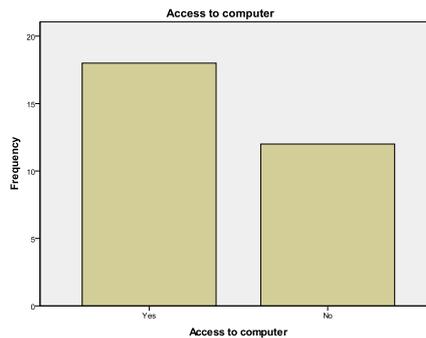


Figure 2: Access to computer

Some of the participants indicated that, the hospital sponsored their training in computing.

*“Some of us have been saved from computer illiteracy because the hospital authorities have sponsored our training in basic computing. Now I can also do some simple things like typing, drawing, and painting with the computers”* (noted by one of the participants)

However, the unavailability of computer at work appears to be affecting the confidence of the workers to use computers, especially among those without personal computers. The participants who were trained stated the training program is currently not helping them.

#### *3.4.2. Experience with telemedicine and e-health services*

Out of the 22 participants interviewed on experience with telemedicine and e-health services, 12 (42.9%) indicated they have some experience with such services whilst the remaining 16 (57.1%) had no such experience. However, all the participants indicated that should the hospital implement EPR, they will definitely need training before they can use such the system very well.

#### *3.4.3 Motivation for EPR*

The participants stated they are motivated to experiment with a new record keeping system since the current record keeping (Paper based record keeping) is riddled with shortcomings that have been compromising their efforts at work. The participants, especially, the nurses noted that writing patient information in different record books takes about 60% of their time at work and they are ready for a system where one entry could just be available “everywhere” by a click. The doctors also noted that, they are ready for a system that can help them have good view of patient data; a system that enable patient data to be displayed in several ways; a system that allow for quick selection of specific patient data and a system that can facilitate comparisons of patient records.

#### *3.4.4. Anticipated changes in work schedules*

The participants were cognizant of the potential changes in work in the event that the EPR is implemented.

*“Is like using mobile phone or advanced mobile phone for the first time; you will encounter some challenges but as you keep on using it, you will master it”* (One participant noted).

They were optimistic disruptions in work flow and schedule would be transient. Some of the participants added that the extent of challenges to be encountered and how fast they learn to use the EPR would depend heavily on several factors such as ones motivation, computer literacy, attitude towards computers, attitudes towards paper based record keeping, dissatisfaction with the paper based system of keeping record among others. In effect, these anticipated changes in work flow, to a large extent, indicate the participants are less likely to get frustrated when those changes start to manifest.

## **4. Discussion**

The success and sustainability of EPR in developing countries is dependent on available and relevant organizational resources. EPR represents a large information infrastructure whose implementation could be more challenging, necessitating the need to determine organizational readiness towards the implementation of such projects.

### *4.1. Organizational readiness*

#### *4.1.1 Financial considerations*

Financial requirements of EPR must be well addressed as finance is needed for every phase of the project, including its long term sustainability. The bedrock of EPR arguably is finance as it is needed during the preparatory stages of EPR, purchasing of the necessary ICT infrastructure (hardware and software), EPR software, maintenance and upgrading of EPR and training of staff. Funds are also needed to refurbish, renovate and equip the ICT department of the hospital. Thus the availability of finance could provide a fertile ground for the sustenance of EPR (al Shorbaji, 2008). Our study revealed that, the university hospital seeks approval for projects and funds from the central administration of University of Ghana. The bureaucracies involved in the process could cause substantial delays in projects and funds approval intended for the EPR. Also, as an organization riddled with many problems ranging from limited medical staff to malfunctioning and unavailable medical equipments, the tendency that these problem areas will compete with EPR for funds is high, and this will in turn impact negatively on the digitalization plan of the hospital espoused by the administrators.

#### *4.1.2. Internet and internet and ICT infrastructure*

The internet situation in many hospitals in developing countries is in it infantile stages and much needed to be done for the successful uptake of the EPR. As illustrated in our case, only the Administration, the Pharmacy Department, the Records Department and Ward 'A' had internet connections. However, as noted by previous researchers (e.g., Geissbuhler, Bagayoko & Ly 2003), there were substantial problems and operational challenges-unreliable connectivity, computer viruses, and limited bandwidth- with the internet connectivity at the University hospital. Problems with internet connectivity and bandwidth could affect the efficacy and efficiency of EPR, resulting in substantial challenges to healthcare delivery. These technical difficulties must be well navigated and appropriate solutions sought before electronic recording can meaningfully contribute to healthcare delivery.

#### *4.1.3. Procurement of EPR*

The success and failure of EPR if adopted in the University hospital would also depend on the design processes and the final design. EPR as an information infrastructure is socio-technically oriented (Hanseth & Monteiro, 1998) and its design must incorporate the social characteristics of the users. As indicated by the administrators, given the vendor the supreme power to decide on the design of the EPR could lead to the risk of developing a system riddled with minimal or no considerations for the social

characteristics of the users (Hanseth & Monteiro, 1998). Failures in EPR design and implementation could be thwarted by ensuring a working collaboration between users and technology developers. The design process of EPR must actively include the end users (health workers) who have ultimate responsibility deciding on the functionalities required. The users are better aware of the limitations of the paper record system. It is also important to stress that, as an information infrastructure, the design of EPR must be influenced by the paper based record system (installed base) (Hanseth & Monteiro, 1998). This will, to a larger extent, ensure the EPR does not deviate largely from the paper record system.

#### *4.1.4. Electricity supply*

EPR, unlike the paper based record, is largely dependent on supply of electricity. In Ghana, power supply from the national grid is not a reliable source for healthcare operations. The problems of erratic power supply and load shedding are characteristic of national power supply in Ghana and can undermine the benefits of using EPR. The acquisition of a standby plant (generator) as an alternate source of power, against any possible problem with the national power, could help meet the power requirements of EPR.

## **5. Health workers readiness for EPR**

### *5.1. Knowledge in and access to computers*

Health workers knowledge in, as well as access to, computers is relevant for determining readiness for EPR. In the current study, majority of the participants (23 out of 30) had some knowledge in computing as some were beneficiaries of the computer training sponsored by the hospital administration. Some of the health workers (60%) stated they have access to computer either at work or at home. For the remaining 40% without access to computers, the tendency that their knowledge in computing will decay is high and there is the need to institute measures to address this problem. Access to and frequent use of computers at work would inadvertently instill confidence in the health workers to use EPR when implemented.

### *5.2. Motivation for EPR*

Motivation has innumerable impact on health workers attitude towards EPR, their willingness to adopt EPR and the extent to which they participate in EPR training programs. The participants indicated they are motivated to use EPR. Having the motivation for a particular task or behavior could be influenced by both internal and external factors. The current study, however, suggests that, the motivation of the health workers to use EPR has been foundational on the challenges that have characterized the paper record system. Intrinsically, the participants realized the need to adopt an alternative record keeping system, an effort which is not linked to extrinsic motivational factors such as management decision to increase pay or introduce other incentives.

### 5.3. Anticipated changes in work schedules

Integration of new communication technologies into existing work practice might alter existing work practices and this can affect the acceptability of such technologies (WHO, 2010). Anticipation of changes in work practice owing to the deployment of EPR is pertinent for reason that, it would position the participants to recognize those changes early enough so as to be able to adapt to the demands of EPR. The anticipation of possible changes in workflow was clearly and vividly averred by the participants in the current study. The participants highlighted changes in data creation, storage, retrieval and data sharing as some of the areas they expect some changes. Though this is just an anticipated changes and not real changes in workflow as a result of EPR, it nevertheless provided some lurid understanding of participants' expectation of changes in workflow.

## 6. Managerial implications of the study

Management of the hospital should take all pertinent steps to ensure funds are available for EPR implementation. Funds are needed for the acquisition of relevant logistics for EPR and the networking of the wards, departments and units in the hospital. The ICT department should be expanded and refurbished with all necessary ICT tools. Staff of the ICT department should be involved in any major ICT project the hospital intends to adopt, to ensure they have firsthand knowledge of such projects so as to be able to act, at least, temporally should there be challenges. It is also recommended that users of the intended EPR are directly involved in the design process which should be user lead or participatory design.

### Acknowledgement

We are grateful to Dr Gloria Ansah, Rita Afful and Mary Thompson for your support in the data collection process.

### Funding

The work was supported by the Norwegian government through the quota scholarship scheme.

### Conflict of interest

None declared.

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