

THE ROLE OF ELECTRONIC MEDICAL RECORD IN NATION CARE
DELIVERY, DEVELOPMENT: CASE STUDY ON GHANA

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Master of Science

by

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DELIVERY, DEVELOPMENT: CASE STUDY ON GHANA:

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And hereby certify that, in their opinion, it is worthy of acceptance.

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DEDICATION

Dedicated to My Dearest Mother and
American Association of University Women Educational Foundation
(AAUW)

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ABSTRACT

Objective: Electronic medical record (EMR) is not only being welcomed by health care providers as a way to improve care delivery, but also serves as a catalyst for development. The purpose of this study is to examine benefits of EMR and its ultimate contribution to development of health care delivery.

Design: This is a qualitative, explorative, and descriptive study using survey questionnaires and a sample size of 50 at the Kole-Bu Teaching Hospital in Accra, Ghana.

Results: Results from the research indicates strong importance of EMR system in developing countries to facilitate effective and efficient data collection, data entry, information retrieval and report generation and research. However, developed nations are not doing enough to help developing countries implement modern technology necessary to facilitate care delivery. It also improves health care planning and decision making and disease management.

Conclusions: To achieve the MDG number by 2015, developed nations must assist poor countries to develop their human capital, funds and work with the local community to design and implement system friendly with their environment to transform and improve care delivery development.

KEY WORDS: Medical Records Systems, computerized, developing countries, information systems, hospital information systems.

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CHAPTER ONE

INTRODUCTION/BACKGROUND

Ghana is one of the peaceful countries in West Africa and for that matter Africa. It has a population of 22 million on an area square of 238,537 square kilometers with an annual growth rate of 2.7%. It has a telephone network capacity of over 3,000,000 lines and telephone density of about 16% or 15 out of every 100 population (Atiku, 2006). Unfortunately although information and communications technology (ICT) such as Telemedicine can improve health care delivery to the poor by reducing cost and hardship of travel to seek medical attention, telephone line penetration is biased toward the urban areas with the capital city Accra accounting for over 70% of the total lines (Cecchini, 2003). The country also has the best health institutions in the region such as the Korle-Bu Teaching Hospital and the Social Society and National Insurance Trust Hospital (SSNIT). For instance, Korle-Bu Teaching hospital located in Accra now performs bloodless surgery. It is currently the only institution in the West African sub-region which performs this type of surgery. Due to the quality of outcome it now receives referrals from most parts of the continent namely the Gambia, Sierra Leone, Liberia, Togo Benin, Tanzania, Nigeria, Cameroon, Cote d' Ivoire and Ethiopia. Despite its exemplary performance, the hospital has no automated hospital information system (HIS) which can help improve care delivery in the region.

However most developed nations have implemented different types of health information systems in the form of electronic medial record (EMR), computerized provider order entry (CPOE) and clinical decision support systems tools (CDS) for effective health planning and assessing the population health needs therefore leading to improvements in care delivery in those countries.

Sadly, Africa like the rest of the developing world is faced with overwhelming health problem such as malaria, HIV/AIDS and tuberculosis that threaten the lives of millions of people (Fraser, Biondich, Moodley, Choi, Mamlin, & Szolovits 2005). Yet most of the worst affected countries lack infrastructure in the form ICT which many researchers consider life saving resources.

The Central government and Christian missions (private non-profit agencies) are the principal health care providers in Ghana (Ghana, 2006). Sources of health services financing include internally generated fund (IGF) or user fees, central government allocations, funding from non-governmental organizations (NGOs) and other donors. User fees for instance started in the early 1970s with the aim “to reduce unnecessary use of services rather than to generate revenue” (Agyepong, 1999, p. 60). However, in 1990 the law was amended asking hospitals to retain 100% of fees; revolving funds for drugs known as Cash and Carry. Cash and Carry also allows institutions to keep revenue for drugs separate and use it for the purchase of only more drugs. Although the law made provision for the poor and treatment during emergencies, people are sometimes denied the necessary care needed because costs are to be borne by the facility in question (Agyepong, 1999).

In addition, over the years, a number of policies have been adopted by the Ghana Ministry of Health (MCH) to improve health care services in the country. Among them is the Expanded Program on Immunization (EPI) and Primary Health Care (PHC) policies. The aims of these policies are;

- ✚ Improve accessibility of health services at the village or rural level
- ✚ Improve the quality of care at the point where it is most needed and

- ✚ Improve and strengthen the management capacity to support the system (Agyepong, 1999; Opong, & Hodgson1994).

However, due to unavailability of accurate data in terms of efficient information systems the objectives of these programs are yet to be fully realized

With globalization – human interaction across the globe where boundaries do not matter any more, many developing countries are beginning to introduce National Health Insurance Scheme (NHS) to make health care accessible to citizens after many years of deregulation and removal of subsidies on health care. In the light of this, NHS is being pioneered in Ghana to aid financial access to health care and the establishment of Health Insurance Fund in order to make health care affordable to all especially those in the rural areas. Subsequently, NHS objectives cannot be realized without adequate health information systems in place. Although EMR systems are complex and vary depending on the developer and implementing health care system, an understanding of what EMR is, how it works and how to implement it are all necessary.

Statement of the Problem

Electronic medical record (EMR) is not only being welcomed by health care providers as a way to improve care delivery, but also serves as a catalyst and gold standard for development (Porter, Kohane, Goldman, 2005; Reifsteck, Swanson, & Dallas, 2006). After Hurricane Katrina the importance of EMR has been re-emphasized, since it destroyed or left inaccessible the medical records of untold number of people. This focused new attention on the need for computerized medical records - health records that follow patients, even if their doctors' offices no longer exist. A disaster does not mean restarting care from the scratch. Unfortunately, Africa, a continent faced with many challenges ranging from epidemics, civil wars and disasters, also lacks robust healthcare infrastructure in the form of information and communications technology

(ICT) to ensure continuity of patient health which many researches considered a life saving resource.

Despite the numerous benefits associated with hospital information systems there are still some problems or challenges that must be overcome. Among them are hardware and software compatibility, training, lack of quality control and antiquated infrastructure (Shortliffe & Perreault, 2001). Irrespective of these challenges the aim of the study is to examine EMR benefits to the patients, physicians, other care providers as well as its ultimate contribution to development of health care delivery in Ghana.

Significance of the Study

We live in a world where two thirds of the population lives in so called “developing countries” under conditions grossly different from those in the richer industrialized countries. With globalization and liberalization of the economy health care and ICT policies are spreading fast across the globe. As a result, we are observing explosion of health information systems infrastructures especially in the developed world with the believe that such technology implementations improve quality of life, lengthening life, lowering the burden of illness, and above all general improvement in disease management an patient centered care (McDonald, 2006). Since good health is not only an important concern for individuals, but policy makers as it plays a central role in achieving sustainable development and effective use of scarce resources (Godal, 2005).

Information and Telecommunications Technologies (ICTs) have continued to shape the world in diverse ways. The Okinawa Charter on the Global information Society, adopted by leaders of the G8 countries at their Summit in 2000 re-emphasized the importance of ICTs in the global development agenda (United Nations ICT Task Force, 2003). Consequently, at the

Millennium Summit in September 2000, 189 Heads of State and Governments committed on behalf of their people agreed on a set of goals to guide development in the 21st century to free citizens from ‘the abject and dehumanizing conditions of extreme poverty’.

The Declaration reaffirms universal values of equality, mutual respect and shared responsibility for the conditions of all peoples and seeks to redress the lopsided benefits of globalization. At the heart of the Declaration are human rights, peace, gender equity, environment and the pressing priorities of the Least Developed Countries and Africa. What have become known as The United Nations’ Millennium Development Goals, or MDGs, Eight Millennium Development Goals emerged from this Declaration, firmly committing governments to an ambitious set of Goals and targets by a deadline of 2015:

Millennium Development Goals

Goal 1: Eradicate extreme poverty and hunger

- Target 1:** Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day
- Target 2:** Halve, between 1990 and 2015, the proportion of people who suffer from hunger

Goal 2: Achieve universal primary education

- Target 3:** Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

Goal 3: Promote gender equality and empower women

- Target 4:** Eliminate gender disparity in primary and secondary education, preferably by 2005, and to all levels of education no later than 2015

Goal 4: Reduce child mortality

- Target 5:** Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate

Goal 5: Improve maternal health

- Target 6:** Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio

Goal 6: Combat HIV/AIDS, malaria and other diseases

- Target 7:** Have halted by 2015 and begun to reverse the spread of HIV/AIDS
- Target 8:** Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases

Goal 7: Ensure environmental sustainability

- Target 9:** Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources
- Target 10:** Halve, by 2015, the proportion of people without sustainable access to safe drinking water
- Target 11:** By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

Goal 8: Develop a Global Partnership for Development

- Target 12:** Develop further an open, rule-based, predictable, non-discriminatory trading and financial system
- Target 13:** Address the Special Needs of the Least Developed Countries
- Target 14:** Address the Special Needs of landlocked countries and Small Island developing States
- Target 15:** Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term
- Target 16:** In co-operation with developing countries, develop and implement strategies for decent and productive work for youth
- Target 17:** In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries
- Target 18:** In co-operation with the private sector, make available the benefits of new technologies, especially information and communications

(Socialist International, 2005, United Nations ICT Task Force, 2003). The MDG number 8 as noted by the Socialist International (SI) explicitly stated – that eradicating poverty and its underlying causes requires a global partnership for development.

Like most countries in sub-Saharan Africa, the major health problems in Ghana are child mortality, maternal death and HIV/AIDS. These health problems are mostly bigger in rural areas where more than half of the country's population reside especially the three northern regions (Upper West, Upper East, Northern and Central Region in the southern part of the country (ITDP, 2005). In line with the millennium development goal (MDG) targets and indicators the government of Ghana has identified a core set of "Top 10-Diseases" to work with health providers on all levels of the country through Community based Health Planning and Services (CHPS).

1. HIV/AIDS
2. Malaria
3. Tuberculosis
4. Guinea Worm
5. Poliomyelitis
6. Maternal and Child Health

7. Accidents and emergencies
8. Non-communicable diseases
9. Oral health and eye care
10. Specialists services, including psychiatric care (ITDP, 2005).

According to Godal (2005), good health is not only important for individuals, but also governments because it plays a central role in achieving sustainable economic development and growth as well as effective use of resource. It is a good thing that the government of Ghana has identified health issues that should be a priority as part of her effort in achieving the MDGs. Despite the progress being made, information and communication technology divide between Africa and the rest of the world remains wide, and the MDGs will only be a mirage without the partnership and assistance from the advanced countries.

To ensure the MDGs are achieved by 2015, the Socialist International challenged Organization for Economic Cooperation and Development (OCED) countries to focus first on delivering Goal 8 – i.e., with more additional and more effective aid, directed mainly to poor countries and also more sustainable debt relief and more trade and technology opportunities for these countries. Again the Socialist International pointed out that for poor countries to realize the MDGs, an additional 50 billion US \$ is needed in aid from OCED countries. Further urgent measures must be taken to fix the problems in the international trade systems that continue to prevent the world's poor countries from trading themselves out of poverty (Socialist International, 2005). However, care must be taken to avoid the situation where “traditional aid programs have seen donors ‘push’ recipient countries, usually those with which the donor nation has some form of historical connection or vested interest, into improvements using aid disbursements to influence specific program activities” (Godal, 2005, p. 901).

In conclusion, considering the top 10 priority diseases identified by the government of Ghana, and also the limited health care services available to Ghanaians in rural areas, I look forward to continue this study at the PhD level and seek some grant to enable me cooperate with the computer science department at the University of Ghana, Legon to design a pilot EMR design for Korle-Bu Teaching Hospital in Accra to facilitate care delivery development in the country.

Purpose of Study

It is therefore the purpose of this study to examine the potential benefits of EMR and its ultimate contribution to improving health care delivery development in less developed countries like Ghana.

Research Objectives

In addition, the objectives of this study are to examine: The benefits and challenges of EMR in developing countries, extent to which infrastructure exist to support EMR implantation in developing countries, extent to which staff are available to train care providers on EMR, how developed nations are helping developing countries to implement EMR, examine pilot project on EMR in some developing countries, how have other less developed countries dealt with this situation, and what does the indicate about the challenges with EMR implementation.

Definition of Terms

Electronic Medical Record (EMR)

An electronic medical/health record (E/HMR) is the compilation of patient medical information in a computer-based format that allows the collection, storage, retrieval and communication of this data (Dick & Steen, 1997).

Bloodless Surgery

A term that has evolved in the medical literature to refer to per-operative team approach to avoid allogeneic transfusion and improve patient outcomes (Martyn, Farmer, Wren, Towler, Betta, Shander, Spence & Leahy, 2002). In other words it is any surgery performed without the use of transfused blood.

Computerized Physician Order Entry (CPOE)

CPOE is a process of electronically entering physician instructions for the treatment of patients. These orders are communicated over a computer network to the medical staff. CPOE decreases delay in order completion, reduces errors related to handwriting or transcription. It also allows order entry at point-of-care or off-site, provides error-checking for duplicate or incorrect doses or tests, and simplifies inventory and posting of charges (Wikipedia, 2006).

Clinical Decision Support System

A computer-based system that enables health care physicians in making decisions about patients (Shortliffe et al, 2001).

Information and Communications Technology

The set of activities that facilitates the capturing, storage, processing, transmission and display of information by electronic means (Cecchini, 2003).

Telemedicine

Is the delivery of health care over distance through the use of computers and telecommunications technology. In most developed countries, Telemedicine has made it possible for people in rural areas to have access to quality care without traveling distance to urban facilities.

Assumptions

The main assumptions of the study were;

1. Healthcare professionals in Ghana know about electronic medical record (EMR)
2. Hospital management and care providers in Ghana recognize the importance of EMR and are open to its implementation.

Summary

Ghana has one of the best health care institutions in the sub region such as the Korle-Bu Teaching hospital in Accra, and the only National Cardio-Thoracic Center (NCTC) which performs bloodless surgery. Currently the NCTC receives referrals from Gambia, Sierra Leon, Tanzania, Cameron etc. Despite its exemplary performance, the hospital lack robust ICT in the form of an automated hospital information system which many researchers consider a life saving resource.

Over the years, the government being the principal health care service provider has implemented a number of policies to improve care delivery development, unfortunately these policies have not yield the necessary success expected due to lack of accurate and timely data. On the other hand, most developed countries are experiencing improvements in care delivery by implementing various kinds of health information systems such as electronic medical record, computerized provider order entry and clinical decision systems. It is therefore the focus of this study to examine the benefits of EMR and its contribution to care delivery, development in less developed countries.

CHAPTER TWO

LITERATURE REIVIEW

Methods

Eligibility Criteria for Studies

Systematic search of the literature is the first step in research since it is the only way by which the researcher can find articles relevant to his or her area of interest. Searching the literature also helps to determine if someone else has already conducted the study as well as what the findings were. Health care institutions in developed nations are shifting from paper-based patient records to implementing electronic medical records or computer-based patient record systems to facilitate medical errors reduction, quality improvement, continuity of care, quality research and effective and efficient health care delivery. Despite the numerous health issues facing most developing nations like Africa, proliferation of Healthcare Information Systems (HIS) is yet to be realized. The focus of this study however, is to examine the benefits associated with such technologies and its ultimate contribution to healthcare delivery, development in Ghana. Selections of materials for this review were chosen because they all dealt with the research topic in some way, taking into consideration these issues;

- Importance and challenges of EMR
- Medical records and challenges
- Development and implementation of EMR in developing countries and
- EMR impact on care delivery in developing countries

Data Sources

The key to successful retrieval is asking the **right questions** of oneself as well as of the system you use, over time. This helps to analyze the information needed for the literature review and determining the broad subject area regarding electronic medical records and developing

countries. After analyzing the information content and coverage of the numerous bibliographic databases and library catalogues, dealing with electronic medical records, computers, information systems, developing countries etc, and the most considered appropriate for this research topic are MEDLINE Ovid, PubMed, CINAHL, COMPENDEX, and Academic Search Premier.

To begin with the search, it is necessary to identify key concepts or words from the topic. These are “Electronic Medical Record” and “Developing Countries” because Ghana is a developing country. The Medical Subject Heading (MesH) for electronic medical record is Medical Record Systems (MRS), Computerized. The scope of this term satisfies the meaning I have in mind. Other MesH synonyms used in the search included; automated medical records systems, computerized medical records systems and patients record, computerized.

Next the second concept “Developing Countries” was considered. Other synonyms are less-developed countries, third-world countries and developing nations. Combination of the two concepts yielded 25 articles. Considering the limited number of articles retrieved, it became necessary to refine the search strategy in order to retrieve more materials since not all the 25 were relevant to the research topic. To increase recall restrictive facet was used to replace the concept “Electronic medical records or computerized. These were informatics/ or "information storage and retrieval"/ or medical informatics/ or decision making, computer-assisted/ or information systems/ or hospital information systems/. All these searches were conducted using MEDLINE Ovid, PubMed, CINAHL, and COMPENDEX. However, the literature search in Academic Search Premier was done using natural language or free text. Thus, “Health Information Systems or Electronic medical record and developing countries”. Lastly,

bibliographies of articles retrieved were also used to get more information. There is no limitation of publication date in the search.

Results

Selection of documents relevant to the study was extremely difficult, because although there have been lots of papers on electronic medical records or computer-based patient records, there exists only a few studies significant to the research area in sub-Saharan Africa. Based on the criteria established in the selection methods 19 sources of materials were identified and classified into four main areas as shown in Table 1.

Table 1 Criterion for Article Selection

AUTHOR & PUBLICATION DATE	EMR BENEFITS	EMR CHALLENGES	TRANSITION FROM PAPER TO EMR	EMR IN DEVELOPING COUNTRIES	PILOT PROJECTS
Fraser et al, 2005	√				
Lévesque, 2001	√				
Powsner et al, 1998	√				
Tomasi et al, 2004	√	√			
Shortliffe et al, 2001		√	√		
McDonald, 1997		√			
Bates et al, 2004		√	√		
Miller et al, 2004		√			
Dick et al, 1991			√		
Ginneken, 2002		√	√		
CPSA, 2004			√		
Fraser et al, 2004					√
Tierney et al, 2002					√
Kamadjeu et al, 2005					√
Tolmie et al, 1997				√	
Simba, 2004				√	
Azubuike et al, 1999				√	
Osunlaja et al, 1997				√	
Jayasuriya, 1995				√	

The first area examines the benefits with EMR such as medical errors reduction, legibility of notes, improved work efficiency and data accessibility. Considering the importance, the authors also discuss why most developed nations in Europe and the United States are implementing the technology to improve care delivery. Despite the great potentials to improve quality of care delivery, EMR has a number of challenges that must be considered when designing and implementing the system. The second category of literature discusses some of these challenges.

The next area looked at strengths and inefficiencies with paper-based medical records and steps organizations must take to move smoothly from paper to computer-based medical records. The third and final categories examined EMR in developing countries. Table 2 summarizes sources of EMR benefits, and Table 3 the challenges identified.

Table 2 Articles Addressing EMR Benefits

AUTHOR & YEAR	MEDICAL ERROR REDUCTION	LEGIBILITY OF NOTES	WORK EFFICIENCY	DATA ACCESSIBILITY
Fraser et al, 2005	√	√		√
Levesque, 2001		√	√	
Powsner et al, 1998		√		
Tomasi et al, 2004			√	

Table 3 Articles Addressing EMR Challenges

AUTHOR	STANDARDIZATION	DATA SOURCES	PRIVACY, CONFIDENTIALITY & SECURITY	COST	FEAR OF CHANGE
Shortliffe et al, 2001	√		√	√	
McDonald, 1997		√			
Tomasi et al, 2004	√		√		
Fraser et al, 2005	√				
Bates et al, 2004				√	
Powsner et al 1998				√	

Importance of Electronic Medical Record

Most developed countries in Europe and the United States of America (USA) are increasingly using EMR due to the belief that it can help improve health care quality. It has also been realized that decision support tools like computerized physician order entry (CPOE) helps in medical errors reduction (Fraser, Biondich, & Moodley et al., 2005). This is possible due to the advances in IT which allows for an in-built mechanism into all the clinical information systems (CIS) to check for drug allergies, drug doses and appropriateness of medication, thereby eliminating the need for physicians to write orders by hand in the patient’s chart. According to Dr. Levesque (2001) “every time someone in practice or hospital touches a chart, it costs the organization nearly \$3” (p. 2). Therefore one main advantage of EMR is that care givers never have to worry about finding a chart since every data or information concerning the patient is already input into the computer.

Another important element of EMR is legibility of clinical notes (Fraser, et al, 2005; Levesque, 2001; Powsner, Wyatt, & Wright, 1998). EMR provides documentation in a computerized format that allows for data or records to be printed in text form rather than hand written. Also the computer checks for spelling, validity and range checks which prompt users

when data entry error is detected. In addition, records in the EMR serve as a legal document since alteration cannot be made to the document without having to enter a new date and time. Electronic medical record increases efficiency of health care providers' workflow (Levesque, 2001). Thus data entered into the hospital information system (HIS) can be used to refer a patient to a specialist. Also, epidemiologists, researchers, physicians and other clinicians can extract information from HIS to protect and promote the health of the population through efficient surveillance, investigation, prevention and control of communicable diseases of public health importance. Especially "identification of risk factors and groups of at risk patients and the obtainment of care quality indicators" (Tomasi, Facchini, & Maia, 2004, p. 867). Further, EMR allows care providers an opportunity to be abreast of the patient health status. For instance, by creating shortcuts to documents warning about abnormal laboratory examination results, prescriptions and drugs administration, physicians are able to quickly provide feedback to patients without any difficulties.

Other benefits of EMR include data accessibility by multiple users and continuous data processing. Multiple users can use the record at the same time from different locations simultaneously without any problem. Finally, data can be backed up automatically and stored at different locations outside the hospital or clinics so that in case of disaster access to the record will not be denied (Fraser et al, 2005; Powsner et al, 1998).

Challenges of Electronic Medical Record

Electronic medical record has great potentials to improve the quality of care delivery. However, despite its importance there are some challenges that must be considered when designing and implementing EMR systems. One limitation is lack of hardware and software standardization. According to Shortliffe (2001) although standards "reduces development costs,

increases integration, and facilitates the collection of meaningful aggregate data for quality improvement and health-policy development” (p. 354), due to the complexity and different needs of each of the units/departments within the health care industry, maintaining technological standards is always difficult. As a result, each department usually implements its own technology pertaining to the needs of that unit which makes it impossible for all systems within the hospital system to communicate. Tomasi et al, (2005) also noted that lack of such standardization reduces importance of automatically generating indicators which are necessary for decision making. Similarly, Fraser et al, (2005) noted that a survey of “US primary care physicians identified 264 different EMRs in use!” (p. 93). Consequently EMR systems development has been dogged by problems of proprietary and incompatibility.

Another major limitation to EMRs implementation is too many data sources (McDonald, 1997). Thus, the sources of EMR information “that do exist (e.g. laboratory data, pharmacy data, and physician dictation) reside on many isolated islands that have been very difficult to bridge” (p. 215-216). Further, each of these sources contains different data and uses variety of methods to capture, structure, and code the needed information. Unfortunately as noted by McDonald, despite these difficulties professionals have not been able to find out how to capture the data from the physician in a structured and computer understandable form.

In addition to these problems are privacy, confidentiality and security issues (Shortliffe et al, 2001; Tomasi et al, 2004). Only computers can manage the large amount of clinical information generated in this information age; however careful action must be taken to ensure that access to this information is made available to only valid and authorized users of the system to protect the privacy and confidentiality rights of patients. There is therefore the need for government and organizations to adopt strict policies and regulations to protect this information.

Privacy and confidentiality protections are necessary for public health promotion since people will feel more comfortable to disclose personal information to health professionals decreasing the risks of spreading infectious diseases.

Security is a very important issue, but it is essential that the appropriate people are able to access information when they need it. Goedert (2004) explains how a medical center in Washington created a virtual private network (VPN) to secure data sent within the facility and other external sources. However, too many VPN's were created and the network became too secure, which caused appropriate users to have to go through many authentication procedures before they could log into various applications. Physicians were not able to do two tasks at once during a single session, to resolve this problem they had to bring in a vendor to re-modify the security settings.

The costs and benefits of implementing and maintaining EMR is another challenge (Bates, Ebell, Gotlieb, Zapp; Mullins, 2003; Miller, Sim, 2004; Powsner et al, 1998; Shortliffe et al, 2001). It is true that hospitals need robust ICT infrastructure especially in terms of hardware and software, but the cost of such technology is highly capital intensive, therefore small hospitals and developing countries especially find it difficult to embark on. However, the long term benefits associated with such technology definitely far out weigh the investment cost (Lorenzi & Riley, 1995). Also, due to the heavy cost involved, any decision to implement an EMR should be a strategic one involving all leaders from every segment of the health care institution to facilitate the design, implementation and maintenance of the system. Further, due to fear, change is often considered a threat which means without adequate involvement of the users of the system, the project can never be developed, implemented and maintained successfully (Leonard, 2004).

In conclusion, ICT promotes greater efficiency and error reduction in the management of diseases. But review of the literature revealed that the numerous varieties in technology applications within the same environment hamper evaluation. As concluded by Tomasi et al, (2004) the most important lesson is the adoption of a single national information systems.

The Traditional Paper-Based Patient Record (PBPR)

For many centuries, the traditional paper-based patient record (PBPR) has been the main source of compiling information about patients' illness, diagnosis and treatment (Roukema, Los, Bleeker, Ginnerken, Lei, & Moll, 2006). As with any other record system, it provided a means of communication between health care providers and the patient. With advances in technology leading to information overload, care delivery has become more complex for clinicians as a result of medical knowledge explosion and increasing importance of communications between health professionals and other care delivers (Tange, 1995). In addition to the complexity, most patients are not seen by only one physician, but a group of care givers. Therefore to ensure continuity of care and medication error reduction as reported in the Institute of Medicine (IOM) Committee on improving the patient record report, the traditional paper-based system proves woefully inadequate, inefficient and ineffective in this information age to meet the needs of modern medicine (Kohn, Corrigan, & Donaldson, 2000).

Challenges of Paper-Based Patient Record

One of the main drawbacks of paper-based patient record is inaccessibility (Shortliffe et al, 2001). The IOM committee report (1991) and Tufo and Speidel (1971) noted in their study that about 30 percent of patient visits in traditional records were not accessible. The reasons attributed were "patients being seen in two or more clinics on the same day, charts not being forwarded, physicians keeping records in their offices or removing them from their offices and

records being misfiled in the file room” (Dick & Steen, 1991, p. 18). Even when the records are readily available, because paper records become bulky with time, it requires a lot of time to access and retrieve appropriate information relating to care management, and especially in real time situations, such as an emergency, this can be frustrating to care providers. In addition, paper records are not portable; therefore do not follow the patient when he or she moves or changes care providers to ensure continuity of care. Consequently, the patient has to repeat the same information and diagnostic examinations over and over again which may lead to vital information being left out. Ignorance of the patient’s medical history, however, can easily cause adverse effects which might even lead to death.

Information content and organization in PBPR are normally illegible or inaccurate (Tufo et al, 1971). Data in medical records are usually not legible and there is no mechanism to check for spellings, validity and completeness of details in the record. Moreover, each provider has his or her method of recording information and what looks clear to one may not be for the other. According to Dick and Steen (1991) other issues related to medical record content include lack of standardization regarding definition of medical terms, inability to capture the rationale of health care providers, among others. The paper-based record is also location bound and consists mainly of unstructured free text (Bates et al, 2003; Dick et al, 1991; Feinstein, 1970; SNOMED, 2003; Stausberg, Priv-Doz, Koch, Ingenerf, Nat & Betzler, 2003). The traditional medical record does not support either multi-tasking or remote access, therefore, can only be accessed at a particular place and time. Thus, care providers at different locations cannot easily access and review patients’ records and medical histories to promote effective and efficient clinical problem solving and disease management. Many researches have shown that data captured in computer can be reused and easily stored, accessed, and retrieved. Although medical records are organized

in chronological order, unlike structured data in computer-based medical record, information are four times faster to find (Fries, 1974).

Other notable problems with paper-based medical record include lack of coordination, data linkages, integration and cost (Dick & Steen, 1991). Traditional paper medical records cannot be shared between different care providers since access is limited to one person at a time. Moreover paper-based record increases administrative, storage and retrieval expenses of healthcare institutions.

Strength of Paper-Based Patient Record

As already noted traditional medical records have been in use for centuries and continue to serve as the major source of information for clinicians in disease management and treatment. In spite of the difficulties and challenges associated with its use, there are a number of benefits users derived from it. The IOM committee on improving the patient record in (1991) identified five strengths of the system from users' perspectives:

- ✚ Paper records are familiar to users who do not want to acquire new skills
- ✚ Paper records can easily be carried to the point of care
- ✚ Once in hand, paper records do not experience downtime as computer systems do
- ✚ Paper records allow flexibility in recording data
- ✚ Records can be browsed through and scanned (if not too large). This feature allows users to organize data in various ways and to look for patterns or trends that are not explicitly stated.

Transition from Paper-Based to EMR

Converting from paper-based to EMR is complex and difficult because it represents a paradigm shift not only in the work of physicians, but other staff. Therefore, the transition

requires a systematic activity and must be managed from many aspects ...”clinically, administratively, culturally, and organizationally. The transition must include not only the process changes inherent in the use of a new tool, but also the technical and procedural training, and the resultant changes to physician and staff roles within the office” (CPSA Guideline, 2004, p. 1). Subsequently, it requires a strong management commitment and motivation (Ginneken, 2002). Secondly, involvement of all stake holders, care providers and other users of the system right from the beginning is necessary for survival and sustenance of the project. Involving them help to have a clear understanding of why the organization is making the change. Involvement and understanding also help users (care providers) to identify themselves with activities that will make the transition very smooth to achieve desirable outcome. As noted in the CPSA guideline, during this process care must be taken not to impact the patient-physician relationship or the integrity of the clinical processes covered be impaired.

The following must be considered during the transition process:

- ✚ Cost of training, hardware and software
- ✚ Type of hardware and software
- ✚ Security of patient information
- ✚ Maintenance of patient privacy and confidentiality
- ✚ Maintenance and integrity of medical record content
- ✚ Integrity of the clinical workflow supported by the medical record must be maintained
- ✚ Continuity and quality of care must be maintained through the transition period (CPSA Guideline, 2004).

To conclude, health care delivery has become more evidence-based and information intensive and ...”much of the process of medicine involves information retrieval, integration,

processing and transmission” (Ginneken, 1995, p. 555; Nowack, & Niccolai 1996). Only ICT tools such as EMR implementation can handle the large volume of health care information to provide greater opportunity for improvement in workflow of clinicians and staff. Unfortunately change is often feared. Such technological transition therefore requires strong managerial strategy, motivation, commitment and leadership that can identify and seek support from change agents within the organization to bring about the cultural and behavioral transformation needed for success and survival of the system.

EMR Opportunities in Developing Countries

Developed countries are embracing the potentials of technology to liberate their economies from traditional constraints of time and space (Entsua-Mensah, 1996). Telemedicine, for instance, is increasing access to improve treatment and quality of care by rural populations by diminishing transport of patients to other facilities. While diseases, disorders and environmental conditions threaten the lives of the developing world, lack of adequate ICT infrastructure is undermining the development of efficient Health Information System (HIS) in these countries where more than half of the population reside in rural areas without access to health care (Tolmie et al, 1997).

Meanwhile without reliable, relevant Health Information System health care providers cannot effectively plan, assess health needs of populations and groups, or make decisions to allocate scarce resources to implement programs, improve the quality of health or address the numerous health issues facing them especially HIV-AIDS, tuberculosis, malaria, civil wars etc. The hindrances could be attributed to a number of factors.

Challenges

Although the need for EMR systems are felt in most third world countries, they lack financial and human resources vital for strategic policy making to either acquire, train, or accommodate informatics professionals to handle the design and implementation of systems to meet their needs (Jayasuriya, 1995; Osunlaja, & Olabode, 1997). Again due to funds and high costs of repair, developing countries are not able to draw up maintenance plans to sustain the few computers and other equipment donated by philanthropies. Some authors believe data collected in developing countries are incomplete, inaccurate, unreliable and not timely, therefore the potentials of EMR may not be realized (Simba, 2004). It is also suggested that the use of EMR might expedite the dissemination of wrong or poor data which does not represent the truth, hence the slow pace of development (Simba, 2004). Further, it is assumed that technology architectures designed for developed countries are appropriate and can easily fit into developing countries' environments. However, considering the differing cultural, organizational and environmental factors, it is essential for systems analysts and designers to research into these areas to design equipment pertaining to the needs of these countries. Finally, EMR implementation in developing countries requires human resources, funds, systematic collection of data, and effective monitoring of the existing system. Governments, health managers and administrators have to exercise strong commitment, and invest in HIS to improve the health delivery status of their citizens. To bridge the digital divide between the North and South, it is essential for international agencies and co-operations to assist developing countries in the areas of technology and manpower developments in order to meet the demand of twenty-first century health care delivery. Finally, as concluded by Jayasuriya (1995), in his study, it is necessary for donors to invest more in "developing capacity rather than in outsourcing IT projects to expatriate

firms and vendors, as in the long-run, the survival of the systems depend on capabilities within the organization” (p. 1606).

Implementation of EMR in Developing Countries

Availability of good quality data for continuity of care, decision making and allocation of limited resources in most developing countries, and especially sub-Saharan Africa, remains a mirage. This section reviews the process of the design and implementation of three EMR projects.

1. MEDCAB, Cameroon

Background: MEDCAB is a locally designed electronic health record (EHR) system for primary health care (PHC) practitioners in Cameroon and released at the beginning of 2003. It is important to note that as with any other place in sub-Saharan Africa, the public sector is the principal health care provider (Kamadjeu et al, 2005).

Design: MEDCAB was designed after in-depth observations and interviews, and modeling of the provider-patient encounters (PPE). Using the International Classification for Primary Care (ICPC-2) disease classification, and Visual Basic 6 (VB) programming language, the system development platform was Microsoft Windows i.e. MS-Access and MySQL as the system’s databases.

Functions: The system consisted of many user interfaces with multiple functionalities including; users’ administration, medical encounter, patient registration, appointment management, report generation, patient card generator, diagnosis, etc.

Implication/Significance: After four months of implementation, there was a significant decrease in coding time, consultation and better management of patients. Also there was significant increase in best practices, i.e. “system prompting for measurement of parameters

and checking for unusual values (temperatures, blood pressures etc.), reminders for conditions requiring special attention and making data from previous contacts readily available” (Kamadjeu et al, 2005, p.184).

2. HIV-EMR, Haiti

Background: Non-governmental organizations Partners In Health (PHI) and Zanmi Lasante have collaborated to launch a community-based HIV treatment program in Haiti’s impoverished area (Fraser et al, 2004).

Design: It is a web-based satellite system hosted on a sever in Boston, USA. It is bilingual (English and French) with an open source system backed by an Oracle database. Categories of data collected in the HIV-EMR are patient demographics, previous treatment and any adverse effects, symptoms, physical examination, laboratory investigations, drugs etc.

Functions: Health care professionals enter all clinical and drug information using a standard patient registration form. The system checks for drug and their doses, administration procedures, allergies. It also has in-built mechanism to detect errors such as prescribing zidovudine and stavudine together.

Implication/Significance: Successful implementation and use of the system has proved the importance of EMR in rural impoverished areas.

3. MMRS, Kenya

Background: The Mosoriot Rural Health Center comprises six separate clinics: Adult Medicine, Pediatrics, Well Children (infants and children < 5 years of age), Antenatal Care, Family Planning and Sexually Transmitted Infections (STI) Clinics. Through collaboration between Indiana University School of Medicine and Moi University School of Medicine led to Mosoriot Medical Record Systems (MMRS) in 2001 (Tierney et al, 2002).

Design: MMRS consists of a paper encounter form, based on IBM-compatible microcomputer powered by a UPS with solar battery back-up and programmed in Microsoft Access using the following modules; Registration, Encounter Data, Reports and Data Dictionary.

Functions: MMRS assign a unique registration number to patients. The Report module generates monthly reports required by the Kenyan Ministry of Health. The Data Dictionary provides information on all diagnosis necessary for treatments.

Implication/Significance: Despite the digital divide, logistical and cultural problems, this simple inexpensive system is serving the needs of the Kenyan rural population by improving on the quality of care, research and training for the local medical school (Tierney et al, 2002).

These projects illustrated the potentials of implementing EMR system in developing countries despite the challenges. To facilitate effective and efficient data collection for policy making, evaluation, disease management and quality care delivery and development, in sub-Saharan Africa and other developing countries, it requires collaboration and involvement of the developed world.

EMR Impact on Care Delivery Development

EMR systems have shown to be feasible and important in developing countries in spite of some challenges. Some immediate benefits on care delivery, development are as follows;

Patient Care: EMR promotes effective and appropriate management of cases leading to quicker recovery without undue hospitalization. The economic impact can be seen in terms of speedy storage and retrieval of patient records thus reducing unnecessary costs of repeating diagnostic examinations over and over (Osunlaja, et al 1997).

Planning & Management: Incomplete and incorrect information is leading to defective health planning and management in most developing countries. Healthcare programs are failing because inaccurate data is used to plan. Access to accurate, correct and timely information could be a good source of data to plan and prepare for epidemics, disasters to prevent undue loss of life (Fraser, et al, 2005; Osunlaja, et al 1997).

Research: “An effective HIS is indispensable in furthering medical research” (Osunlaja, et al 1997, p. 42). Availability of quality data enhances identification of problems in treatment and finds solutions to prevent extra costs due to ineffective treatment and making care delivery less expensive.

Summary and Critiques

Health care delivery has become more evidence-based and information intensive which makes the traditional medical record system woefully inefficient to support modern healthcare. Studies have shown only computerized information system can manage the large volume of records generated in the health care industry (Entsua-Mensah, 1996). Developed nations have embraced the technology by implementing EMR, and decision support tools to help reduce medical errors and improve health care quality. Unfortunately, most developing countries facing many health problems from epidemics to civil wars also lack robust healthcare infrastructure to ensure continuity of patient health. In spite of the challenges of implementing HIS architectures in those countries, studies have shown how feasible it could be with support from developed nations to design and implement system the fit into that environment (Jayasuriya, 1999; Tierney et al, 2002). As noted by Jayasuriya (1991) “the implementation of computerized information system in developing countries tends to suffer from the assumption that models utilized for developed countries are appropriate without recognizing the idiosyncrasies of the organization

and the culture” (p. 337). The main gaps identified in some of the articles were: failure to include cost benefit analysis of health care IT in developing countries and their focus on the importance and challenges of the use of ICT in general rather than their concrete evaluation application to the health care industry. Also, most of the studies focused on developed countries without any relevance to developing countries. There is the need for more research in this area relating to developing countries.

The present study will contribute to this gap in the research by examining the benefits of EMR, and its role in the development of care delivery in less developed countries like Ghana. In addition, the following questions are to be addressed: To what extent does infrastructure exist in developing countries to support EMR? To what extent is staff available to train care providers on EMR? How much are developed nations helping developing countries with implementation of EMR? How have other less developed countries dealt with this situation, and what does the literature indicate about the challenges associated with EMR implementation?

CHAPTER THREE

METHODOLOGY

This chapter describes the design, sample, and procedures involved in this research. Because this is an exploratory study conducted in Accra, Ghana to examine the potential benefits of EMR and its contribution to improving health care delivery, it is largely descriptive, and categorized as a non-experimental qualitative study. Initial contacts were made with the Chief Executive Officer (CEO), Public Relations Officer (PRO) and the Chief Administrator of the Korle-Bu Teaching Hospital to help solicit participants for the study.

Overall Study Design

Survey Methodology: Survey approach was used to gather data from health care professionals who were considered principal users of EMR. Soft copies of the questionnaires were sent through e-mail to participants as well as other hard copies that were hand delivered to subjects.

Development of Survey Instrument: Based on the focus of the research and systematic review of the literature, the content of the instrument designed was open-ended questions based on the following areas;

- ✚ Knowledge of EMR
- ✚ Benefits and Challenges of EMR
- ✚ Transition from paper-based system to EMR
- ✚ Security issues and
- ✚ Assistance given to developing countries by developed nations to implement or use EMR
and
- ✚ Demographic details based on profession, length of practice, age and sex.

The survey instrument can be found in Appendix A.

Pre-Test or Pilot Survey: Ten questionnaires were administered to selected health care professionals at the University of Missouri Health Care. The purpose was to discover potential problems or identify questions that may be misinterpreted, so that the questionnaire could be revised before it was administered to the larger population and possible coding system and themes to use.

Participants or Sample

This study used a systematic non-probabilistic sampling procedure. Subjects were selected based on their level of healthcare training. The population set for the study was healthcare professionals from the Korle-Bu Teaching Hospital, which include physician consultants, surgeons, anesthetists, pharmacists, nurses/midwives, pathologists, radiologists and laboratory technologists. Study participants were limited to these previously mentioned health professionals, since they would be the principle users of an electronic medical record system.

Representativeness: Because the study was conducted in one hospital, and taken into account the total number of approximately 1000 professionals and difficulty in getting volunteers, a sample size of 50 was reasonable enough for the study.

Informed Consent: The study was reviewed by the University of Missouri Health Sciences Institutional Review Board and approved as an exempt project number 1078582. In the waiver of documentation of consent it was clearly stated that participation in the study was voluntary, and there was no penalty associated with subjects declining to participate.

Procedures or Administration

After approval by the IRB, survey questionnaires were converted into a PDF file and mailed electronically to all participants on November 13, 2006. An environmental health officer

with Accra Metropolitan Assembly (AMA) was contacted and helped to distribute hard copies of the questionnaire and consent letter to all participants because the researcher could not travel to Ghana. Participants were requested to fill out the attached survey and return it in a sealed envelopes to this person or the chief administrator. After 3 week thus, December 14, a first reminder was mailed asking for their cooperation and the importance of returning the survey. A final reminder was sent after another 3 week period to those who might have forgotten to return it.

Data Quality Control

The following measures were taken to ensure reliability and validity of survey instrument

- ✚ A second coder was identified who assisted with coding the questionnaires
- ✚ A database was also created in MS-Excel to enter all data for analysis

Data Analysis

The following steps were also taken to analysis the data.

- ✚ A coding system was designed for each question
- ✚ Responses were then placed into themes and summarized and
- ✚ Finally the survey responses and themes were used to determine result interpretation and recommendation

Responses

Despite initial difficulties, 45 out of the 50 surveys containing 19 questions were returned on January 18, 2007 thus representing 90% response rate.

Summary

This section focused on the design, sample and procedures involved in the study. The research was largely exploratory and descriptive therefore considered non-experimental and

qualitative in nature. Survey methodology approach was used to gather data from health care professionals. Because the study took place only at the Kole-Bu Teaching hospital in Accra, Ghana, a sample size of 50 was considered adequate. Finally an open ended survey instruments were designed taking into consideration the purpose and objectives of the study as well as the systematic review of the literature.

CHAPTER FOUR

RESULTS

Based on the methodology, surveys were mailed to 50 participants at the Korle-Bu Teaching Hospital in Accra, Ghana. Forty-five surveys from 45 respondents were received which included 19 questions. To begin with data analysis, all 45 responses were coded, and typed, before sorted and organized into themes. The results from all participants are as follows:

Demographics

The 45 respondents comprised of 28 males, 16 females and 1 person who did not indicate his or her gender. The mean age of the group was 30.1 (range 22-40). Table 3 presents professional distribution of participants.

Profession	Number
Surgeon	2
Anesthetist	3
Pharmacist	3
Physician	3
Radiologist	3
NR	4
Midwife	5
Nurse	6
Laboratory Technologist	6
Student	10
TOTAL	45

Table 4 List of professionals

NR (No response) represents people who did not include their profession. The 10 students however, included final year medical and dentistry students, as well as nursing, and medical laboratory students. Practicing workers experience ranged between 1 and 11 years.

Knowledge of EMR

According to Dick and Steen, EMR is the compilation of patient medical information in a computer-based format that allows the collection, storage, retrieval and communication of this data. Therefore to analyze this result, these key words, computerized, storage and retrieval were used to determine respondents understanding of the concept. Subsequently, one third of respondents (33.3%) who included these three key words were marked as right. While 9 people representing 20% who said it is a mechanism for storing patient medical record on computer were classified as partially right and approximately half respondents (46.7%) who just said the use of machine to keep patient medical data were classified as having an idea or understanding of the system.

In addition, implementing and running a successful EMR system requires a number of key things. Accordingly, 27 people identified technical things (electricity, hardware, software etc), 13 stated patient data, while 4 said adequate trained personnel and 1 person said resource (money to train staff on EMR). Also availability of adequate infrastructure, information and communication technology experts to support and train care providers on EMR is very crucial when implementing EMR system. However, more than half respondents agreed that enough infrastructures are not available in Ghana to support EMR implementation. On the other hand, 18 people believed infrastructures are there whilst 4 said available infrastructures are only few. Despite unavailability of infrastructures, 29 respondents reported there are experts in Ghana to train health care providers to use EMR. Figure 1 shows responses on level of experts available at Korle-Bu.

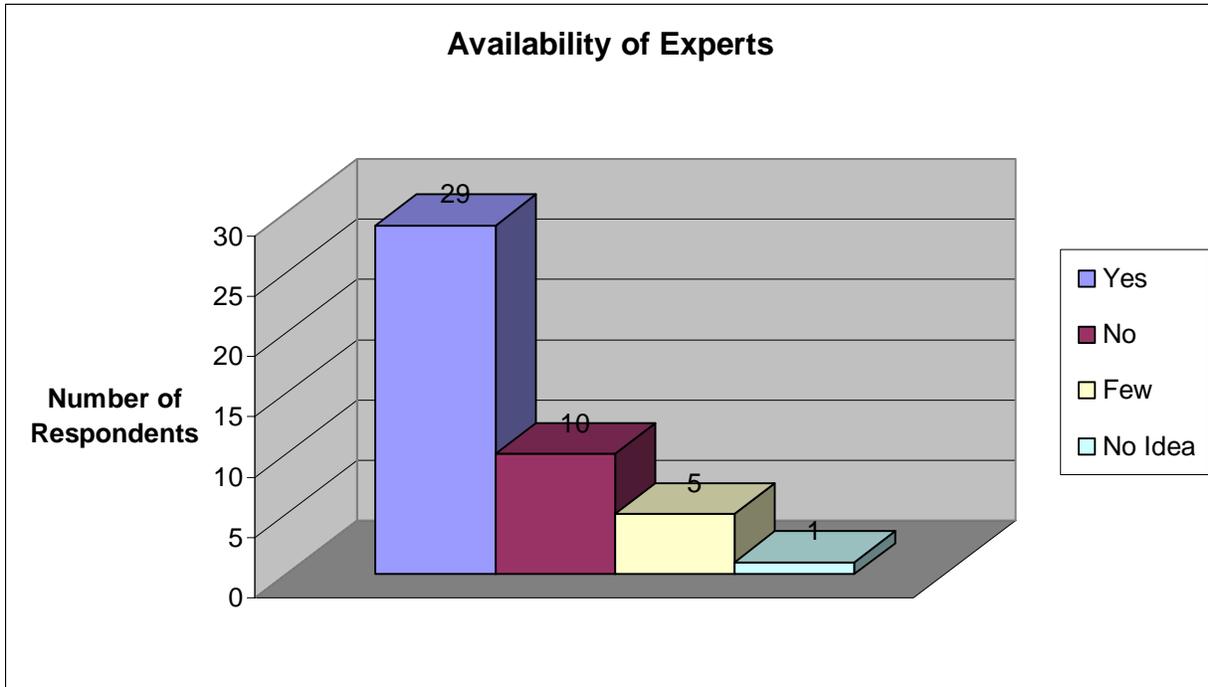


Figure 1 Availability of ICT experts to train care providers on EMR

Assistance given to developing countries by developed nations to implement EMR

Responses concerning how much developed nations are assisting less developed countries like Ghana with hospital information system infrastructure implementation showed diverse opinions. Nine persons said developed countries are helping, 17 responded no. However, 11 indicated “the help given from developed nations are not enough and sometimes electronic devices sent to less developed countries are inferior and lack quality”. Still others think “some form of assistance comes in to support the country on ICT but not much is channeled to the health sector”. Lastly, 7 persons reported they have no idea “if developed nations are helping” Finally, 1 person did not respond to this question at all.

Reasons why EMR is not being used at Korle-Bu Teaching Hospital

Paper records are bulky and take up costly space. Filing, retrieval of files and the re-filing of paper records are very labor intensive methods with which to store patient information. Plus if a record is checked out for one department another department cannot access the chart. The impact of not having immediate access to key information in emergency situations can be serious. Paper medical charts also cannot be effectively searched and used to track, analyze and/or chart voluminous clinical medical information and processes. They cannot be easily copied or saved off-site. Also physician's orders and the corresponding results (meds, labs, etc.) can be issued and saved in a comprehensive EMR system. Our literature review and results have proven that paper records are costly, cumbersome, easily misplaced and cannot be used for any meaningful decision analysis.

Unfortunately, in spite of Korle-Bu Teaching Hospital's performance and recognition in the sub region, it does not have any HIS in place to facilitate care delivery. As noted by participants, "EMR software is not used at Korle-Bu because administration keeps complaining of money. It looks expensive to them and also they are more used to the paper folder". Nevertheless four key issues were identified by participants as the main reasons why Korle-Bu does not have EMR system in use. First, 40% of respondents attributed the problem to lack of resources in terms of personnel, infrastructure etc, 29% blamed it on lack of leadership initiative and priority. While 18% reported cost in terms of equipment and training personnel. 11% however, stated lack of EMR importance or awareness and fear to change. Lastly, 2.2% respondents did not give any reason.

Benefits and Challenges of EMR

Most developed nations are implementing EMR and other HIS due to the benefits associated with it. According to the survey results, some benefits of EMR are; Easy accessibility and retrieval, storage, communication and consistency in work performance, time saving and cost, easy monitoring and treatment of diseases, prevention of the possibility of mixing patient’s record loss, and it also ensure confidentiality and privacy of documents. In Figure 2, importance of EMR in care delivery is shown.

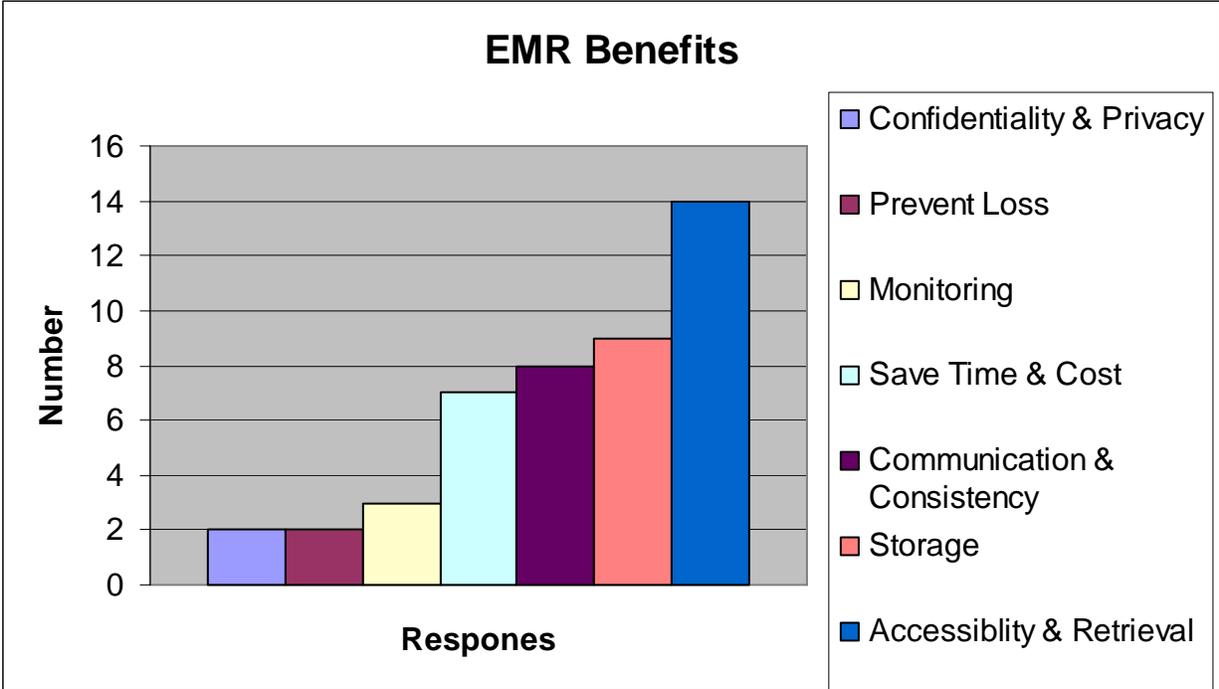


Figure 2 Some benefits associated with EMR identified by participants

Regarding some potential barriers associated with EMR use, 21 respondents representing 47% mentioned lack of power or electricity. According to participants “hospitals cannot operate effectively when there is power failure”. As a result, it will be difficult accessing and retrieving patient information for decision making. Eight respondents (18%) attributed the problem to cost in terms of training personnel, maintenance, and cost of acquiring the EMR equipment. Six

mentioned lack of technical know how (personnel and education), another 4 said people are not prepared to change from the traditional paper-based systems representing 13% and 9% respectively and lastly 6 persons (13%) did not provide any response.

EMR and care Delivery Development

As shown in Figure 3, from the survey results, it is clear that many participants believed implementation of EMR will tremendously improve upon care delivery in the country. For instance as noted by one respondent, “availability of patient past history in electronic format will enable health care workers have information about patients in seconds and with ease which will facilitate quick diagnosis and treatment hence reducing the state of morbidity and mortality, leading to quality health care delivery”.

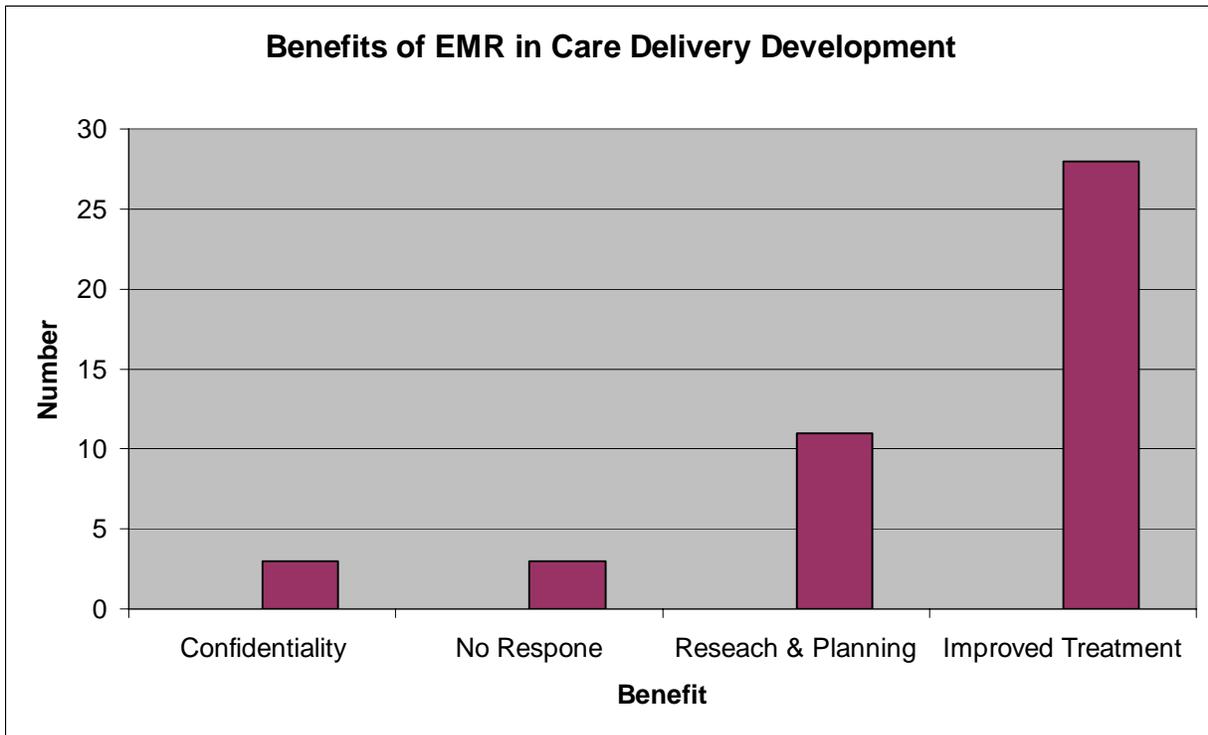


Figure 3 EMR contributions to care delivery development

Transition from paper-based system to EMR

There is always some level of fear and resistance to change especially in the health care industry. A question concerning the level of acceptability from the traditional paper-based system to EMR system showed that; such change will be met with some difficulties. More than half of respondents said the process would be challenging initially, but eventually care providers will accept the system because it will facilitate care delivery and work performance. Although majority may still prefer the paper-based system, “they will change when they see the importance or need for EMR stated by a participant. Others also believed it would be “welcome news”. Figure 4 illustrates time require to train health professionals at Korle-Bu to use EMR



Figure 4 How quickly care providers can be trained to use EMR

Security Issues

The adequate protection of patient health record requires limitations at all levels i.e. collection, use, access and disclosure. Therefore development of privacy, confidentiality and security principles are necessary to protect patients' interests against inappropriate access to their health data. Unfortunately, 21 respondents (47%) did not respond to this important question regarding measures necessary to maintain patients' privacy, security and confidentiality at Korle-Bu. However, 13 and 5 persons representing 29% and 11% respectively did state all health records must be securely protected by use of password, data encryption and access restrictions to users. Finally as noted by one respondent, "physicians must uphold to their Hippocratic Oath to respect the privacy of their patients and federal legislation must be passed to support the system".

Functions of Computer-based Patient Record (CPR)

CPR has many components and functions. Participants were asked to rate on a scale of 1 to 10 nine different functions of CRP according to their order of relevance to their work. Twenty-six respondents (58%) rated the functions correctly, 14 representing 31% rated it wrongly and 5 persons (11%) did not response at all. Figure 5 shows the averages of the corrected ratings by the 26 persons in relevance to their work.

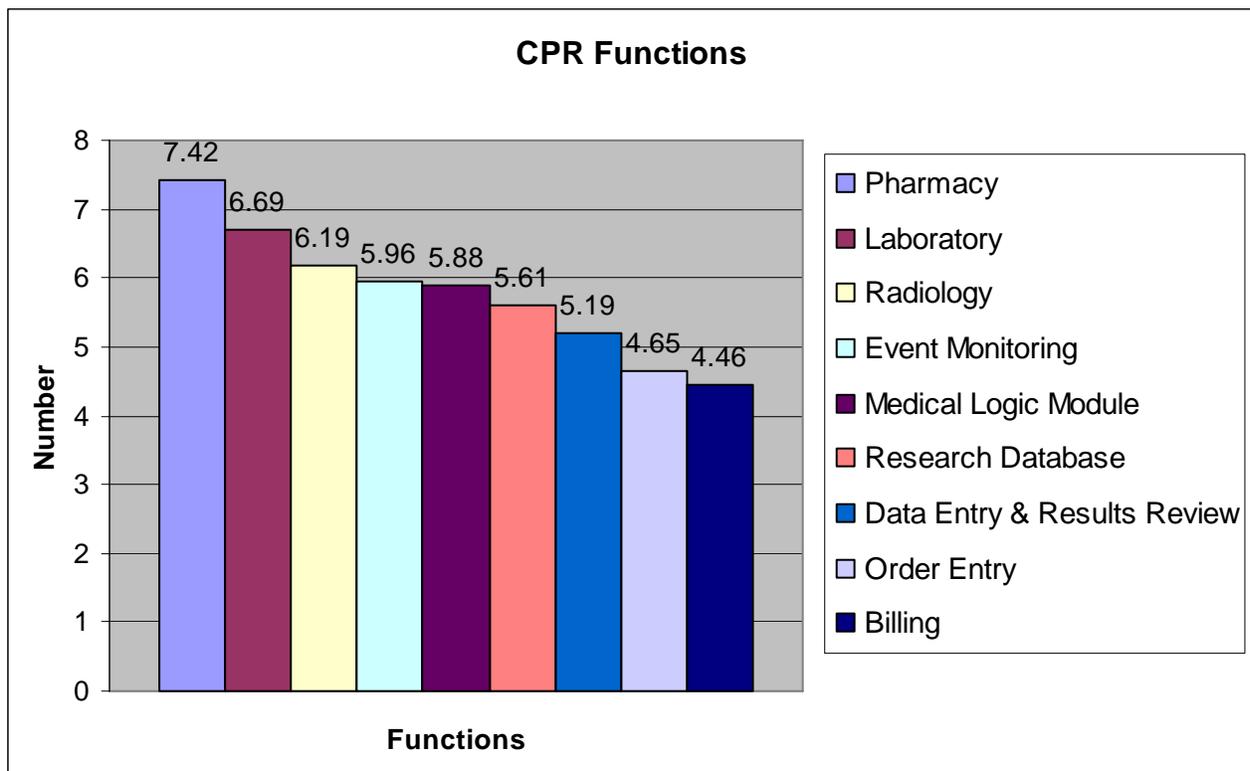


Figure 5 Functions of CPR in order of importance of job

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of Results

The study focuses on the role of EMR in care delivery, development. Using survey methodology developed, we analyzed 45 people at the Korle-Bu Teaching Hospital in Accra, Ghana, about the benefits of EMR and how it can contribute to care delivery development in developing countries. Results from the research indicates strong importance of EMR system in developing countries to facilitate effective and efficient data collection, data entry, information retrieval and report generation and research. It also improves health care planning and decision making and disease management. Further, due to absence of legislative body such as HIPAA, NIST etc, in Ghana to enforce regulations against breach of privacy, confidentiality and security of electronic patient record, findings indicated “passage of laws to back the implementation of the system”.

Considering hydro power as the main source of electricity in Ghana, and due to the low level of water in the Akosombo Dam leading to power rationing in the country, more than half of respondents suggested constant electricity supply is the most important thing to take into account when implementing EMR due to the inability of the hospital stand-by generator to kick in immediately during power outage. This was the most interesting result; because it never occurred to us electricity was a major factor to consider when considering EMR implementation. Some responses we expected to see were hardware selection and installation, software configuration, space, security, dealing with paper record etc. In spite of this problem, study results revealed that developed nations are not doing enough to help developing countries implement modern technology necessary to facilitate care delivery. Finally, results of question number 10 (In what

ways can EMR improve or increase your work efficiency as a care provider?) on the survey were not reported because responses provided were the same as those of question 2.

Conclusions

The potential of EMR system to transform medical care practice has been recognized over the past decades to enhance health care delivery and facilitates decision making process. Subsequently, EMR and other clinical decision support system tools are currently used in both primary and secondary health care facilities in most developed nations. However, implementing an EMR system or any HIS in a clinical practice is a daunting task. It requires good planning, strong management and physician leadership and supportive staff. The most immediate benefits of EMR system include accurate medication lists, legible notes and prescriptions, immediately available charts, decreased chart pulls, lower transcription costs, medical errors reduction and improve quality care and standard in patient safety. Unfortunately most countries in sub Saharan Africa and other poor nations lack the experts, fund and ICT infrastructure necessary for the implementation of such modern health care technology to ensure continuity of care.

Recommendations

Research indicates that ICT interventions are contributing to improved efficiency of health service deliveries in the first world. At the same time many scholars believe one possible area of ICT intervention in the health domain is the automation of medical record system. Further due to medical knowledge explosion, appropriate decision making and plan demands accurate, timely, relevant, and appropriately formatted information. Unfortunately most countries in sub Saharan African and other poor nations lack ICT infrastructure, fund and experts to facilitate modern health care delivery. Therefore to achieve the MDG number 8, bridging the digital divide between the north and south by the year 2015, and to significantly improve patient

care, reduce paperwork and speed the operations of facilities to promote quality health care, it is necessary international organizations and governments assist poor countries with funds, develop their human capacity and work effectively with the local experts to design and implement information systems that will strengthen these countries health systems performance, because in the absence of continuity of care, continuity of information is essential to optimize healthcare delivery.

Limitations of the Study

In the first place, due to difficulty of getting other hospitals involved, the study was limited to only one hospital, hence our findings represent views of that hospital alone. However, we believe the research would have been more interesting and challenging and results more generalized if professionals (subjects) from other hospitals such as the 37 Military Hospitals, the Police Hospital and the Trust Hospital were involved in the study. Secondly, due to cost of air travel between the United States and Ghana the researcher was not able to travel to Ghana to collect the necessary data for the study which affected inability of participants to respond to some important questions on the survey.

Future Research

Automating the paper-based health record system can have a lot of importance for practitioners (clinicians), patients, administrators and managers. Therefore, we hope this exploratory study will serve as a baseline for funding organizations to help health informaticians explore and collaborate with any of the universities in Ghana to design and implement EMR and other clinical decision support systems to actually access the level of care delivery development in developing countries. Finally, we will recommend rewording of question number 10 in any

future study to enable participants respond appropriately as well as researchers going to Ghana for their data collection.

APPENDIX A - SURVEY QUESTIONS

1. What is your understanding of electronic medical record (EMR)?
2. What are the things needed to implement EMR?
3. Are there enough infrastructures in Ghana to support EMR implementation?
4. Are there available information and communications technology experts to train care providers on EMR?
5. In your opinion, how much are developed nations helping less developed countries to implement EMR?
6. What are the reasons why EMR software is not being used at Korle-Bu Teaching hospital?
7. Identify some potential barriers (pitfalls) associated with EMR use?
8. What do you think are some of the benefits associated with EMR use?
9. Identify some ways by which EMR can contribute to care delivery development in Ghana?
10. In what ways can EMR improve or increase your work efficiency as a care provider?
11. How quickly do you think care providers can be trained to use EMR?
12. To what extent will care providers accept the process of changes necessary to implement EMR?
13. What would be the ideal approach necessary in Ghana to maintain patient's security, privacy and confidentiality?
14. What would be the challenges associated with the move from traditional paper-based system to computer-based patient record (CPR)?
15. On a scale of 1 to 10, with 10 being the highest rate the following functions of CPR on your order of importance to your work.

COMPUTER-BASED PATIENT RECORD FUNCTIONS	RATE
RADIOLOGY (X-ray results, images etc.)	
PHARMACY (Drug ordering etc.)	
LABORATORY (Lab tests, sensitivity & specificity analysis etc.)	
DATA ENTRY & RESULTS REVIEW (Patient demography, appointments schedules etc.)	
BILLING & FINANCIAL SYSTEM	
EVENT MONITOR	
MEDICAL LOGIC MODULES	
ORDER ENTRY	
RESEARCH DATABASES	

16. What is your main profession?
17. How long have you been practicing?
18. Age
19. Sex.

THANK YOU.

APPENDIX B - INFORMED CONSENT

October 31, 2006

Dear Participants,

As part of a research I am conducting on the topic “The role of electronic medical record (EMR) in nation care delivery, development: a case study on Ghana”, I invite you to participate in the attached survey on EMR and its contributions to care delivery development at the Korle Bu Teaching Hospital.

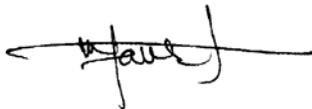
Despite the benefits of EMR, its implementation success and sustainability within any Hospital Information System (HIS) depend upon users’ acceptance and satisfaction. The perceptions and attitudes of physicians and staff toward EMR are indicative of its ultimate success. Results of this survey will help us to better understand acceptance of and satisfaction with EMR and its contribution to care delivery, development in Ghana.

Participation in this survey is voluntary, and there is no penalty associated with declining to participate. Information obtained from the surveys will not be given to anyone unaffiliated with the study in a form that could identify you without your written consent. Your responses will be coded such that you will not be identified and information provided here is simply an effort to enable you to make a more informed decision about participating in the survey.

I would greatly appreciate your filling out the attached survey and returning it to me or the Chief Administrator. If you have any questions regarding your rights as a participant in this study or if you feel under any pressure to participate, you may contact the University of Missouri Health Sciences Institutional Review Board (which is a group of people who review the studies to protect participants’ rights) at 573-882-3181.

If you have any questions or concerns about this study, please contact me at 573-771-0266 or by e-mail at few4h8@mizzou.edu.

Sincerely,

A handwritten signature in black ink, appearing to read "Faustine", with a long horizontal line extending to the left.

Faustine Williams
University of Missouri-Columbia
MS, Health Informatics
May 2007, Expected

APPENDIX C - IRB APPROVAL LETTER

**Institutional Review Board
Health Sciences Section**

University of Missouri-Columbia

125 Folk Hall
One Hospital Drive
Columbia, MO 65212
PHONE (573) 882-3181
FAX (573) 884-4401
E-MAIL: irb@missouri.edu

WEB: www.research.missouri.edu/hsirb

November 3, 2006
Suzanne Boren, MD
Health Management and Informatics
324 Clark Hall
Columbia, MO 65212

Dear Dr. Boren,

Regarding your application for approval of the research project, *The role of electronic medical record (EMR) in nation care delivery, development: Case study on, Ghana*, the Health Sciences Institutional Review Board (HS IRB) took the following action:

- a. Approved the application through exempt review on November 2, 2006.
- b. Found the project to be exempt under 45 CFR 46.101 (b) (2).
- c. Reviewed and approved any instruments that were submitted with the application.
- d. Found that there is no HIPAA requirement for this project.
- e. The HS IRB has determined that the approval for this study will expire on November 2, 2007. An Exempt Annual Update must be submitted a minimum of one month prior to this date.
- f. Upon completion of the study a Completion Form must be submitted to the HS IRB office. If the closure is not documented on the Completion Form, you may close the study at the time of the annual review.

Please reference **IRB Project #1078582** in all future communications with the HS IRB Office regarding this project.

No change may be made in an approved protocol or instrument unless said change is submitted to and approved by the HS IRB.

Do not depend on the HS IRB for your record keeping. Pursuant to federal regulations, the HS IRB retains files only three years after termination of a research project.

Sincerely,

Michele R. Kennett
Compliance Officer
Enclosure

APPENDIX D - IRB EXEMPT APPLICATION

HS IRB Exempt Application Signature Page

Project Number: 1078582

Review Number: 59731

Project Title: The role of electronic medical record (EMR) in nation care delivery, development: A case study on Ghana.

Principal Investigator: Suzanne Austin Boren

CERTIFICATION

The undersigned certifies that the information provided in this document is complete and accurate. The undersigned assures that modifications to the originally approved project will not take place without prior review and approval by HS IRB, and that all activities have been and will continue to be performed in accordance with federal, state, local and University of Missouri - Columbia policies and regulations.

Suzanne Austin Boren 11/1/06 (advisor to Faustine Williams)
Signature of Principal Investigator Date
FAUSTINE WILLIAMS 10/31/06
Document Prepared By Date

FOR HS IRB USE ONLY	
Project is exempt under 45 CFR 46.101 (b) (2)	
APPROVED/ACKNOWLEDGED	<u>Michelle Kennett</u>
HS IRB Authorized Representative	
DATE OF SIGNATURE:	<u>11.2.06</u>
Full Board: <input type="checkbox"/> Expedited: <input type="checkbox"/> Exempt: <input checked="" type="checkbox"/>	
APPROVAL/ACKNOWLEDGED DATE:	<u>11.2.06</u>
APPROVAL EXPIRATION DATE:	<u>11.2.07</u>

Please send signature page and supporting materials to:

Health Sciences IRB
125 Folk hall; Dc074.00
One Hospital Drive
Columbia, MO 65212



https://irb.missouri.edu/eirb/forms.php?action=Print_Signature_Page&proj_num=107858... 10/31/2006

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