IMPROVING THE SECURITY OF HEALTH CARE INFORMATION THROUGH ELECTRONIC MEANS

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ABSTRACT

Around 40 years ago the health care sector began to look towards computers to help with the everyday functions that clinicians performed. While a good idea at the time, it took 20 years before the concept of a health care or health information system was truly accepted as the information and communication technology had matured enough to implement the systems. Health care systems have evolved from stand-alone systems to systems with limited interoperability. However, due to lack of standards, wide-scale interoperability has not been achieved as yet.

Research is currently ongoing to examine the advantages and disadvantages of health information systems. There are various points of view amongst researchers as to whether the disadvantages outweigh the advantages with regards to security in particular. This paper sets out to investigate both sides of this argument, through literature studies. The paper concludes that the security and privacy of health information can indeed be improved through the use of electronic health records (EHRs), but only through proper consideration for the factors that support an EHR environment, e.g. technological, organizational and governance / legislative factors.

KEY WORDS

Electronic health records, standardization, HL7, security, privacy

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1 INTRODUCTION

Availability is generally accepted as a critical characteristic of information. This is especially applicable in reference to the availability of electronic patient information. If doctors or medical personnel are unable to access the necessary information, then patients could be given incorrect diagnoses and erroneous treatment.

Over the years, various approaches have evolved towards computerizing and improving the availability of electronic patient information, viz Computer-based Patient Records (CPRs), Electronic Medical Records (EMRs)/Electronic Patient Records (EPRs) or Electronic Health Records (EHRs). The objective in general, is to provide access to patient information by clinical staff at any given location; facilitate accurate and complete claims processing by medical aid companies and documentation of prescriptions, amongst other functions.

Interestingly, the acronyms CPR, EMR and EHR are often confused. It is frequently overlooked that these three terms actually constitute three different types of health information systems. The Computer-based Patient Record, or CPR, was the original concept of the electronic healthcare system, but these became outdated because of incompatibility between different vendors' software. The Electronic Medical Record, or EMR, is the current standard and provides greater interactivity and real-time accessibility. Finally, the Electronic Health Record, or EHR, is the next step in the evolution of electronic patient records. The major difference between the EMRs and the EHRs is that instead of the hospital owning and running the systems, the EHRs will be owned by the patients themselves. They will, in turn, allow certain providers to be able to access their medical records.

Notably, there are indications from literature, that security-related issues are considered as barriers to the use of EHRs. This appears to hamper the general acceptance of and progress towards the implementation of EHRs. The objective of this paper is to illustrate that EHRs should be used in modern healthcare because they improve the availability of patient information, understandably a critical consideration in the operation of the healthcare sector. In addition, it will be argued that the confidentiality, integrity, availability and privacy of electronic patient information are strengthened through the use of EHRs. However, this can only be achieved through proper consideration for the factors that support an EHR environment, e.g. technological, organizational and governance / legislative factors. This paper will analyze the factors that hamper the confidence in and the implementation of EHRs and will show how proper consideration of those factors will ensure that the EHR can operate effectively and securely, with due consideration to the privacy of patient information.

2 BACKGROUND

2.1 Historic Overview

The paper-based medical record arose in the 19th century as a highly personalized "lab notebook" that clinicians could use to record their observations so that they could be reminded of pertinent details when they next saw the same patient (Shortliffe, 1999). Doctors tended to work alone and wrote down their patients' medical records using this paper-based format. Patients were considered friends to these early doctors and often paid them directly (Tipton & Krause, 2004). As time progressed, people started to think that maybe there was another way that could provide well-organized and well-timed access to patients' health records (Waegemann, 2003).

During the early 1960s, computers were first used within a hospital setting, however at this time they were only used for administrative and financial functions. At this time there was early work being conducted in the medical informatics area. This work focused on clinical computing to improve clinical decisions and reduce medical errors as well as ensuring faster access to applicable medical information and decision support functions. Examples of the early EMR versions, or the CPRs, include the HELP system at LDS Hospital in Utah, the COSTAR system at Massachusetts General Hospital, the TMR system at Duke and the Regenstrief Medical Record System (Berner, Detmer, & Simborg, 2005).

Even with all of the scientific medicine growth (more pharmaceuticals, etc), the adoption of computer applications was between low and non-existent for many different reasons. One of these reasons was that clinicians were not willing to accept early systems because they felt that they were too expensive, slow and awkward. Administrators were against these EMRs because it was not clear what the financial benefits would be at the time. Another reason for lack of adoption in the United States, was that the federal government created the Medicare and Medicaid legislation. Under this law, administrators and insurers both felt satisfied to let medical staff continue to practice separately (Berner, et al., 2005).

However, by the beginning of the 1980s, technology that could compliment EMRs had greatly evolved. The original mainframe computers were being replaced with distributed networks of microcomputers, Microsoft Windows had been introduced and networking proliferated. This eventually led to the creation of the HL7 standard to allow for data interchange of health-related information.

Unlike during the 1960s and 1970s, there were a number of governmental programs that promoted policies that helped distribution of the EMR. A conference held at the National Institute of Health in America in the late 1980s led to a report being released in 1991 specifically dealing with the Electronic Health Record. This report, called “The Computer-based Patient Record: An essential technology for health care”, looked at three main features: uses and users, technology and policy and implementation. This report led to the construction of the Computer-based Patient Record Institute and was the Institute of Medicine’s most widely distributed publication. Since merely recasting the medical record wasn’t enough, a complete rethink was needed. Thus the medical record became known as the Computer-based Patient Record (CPR) and twelve essential functions were associated with it.

The most spectacular change since then was the explosion in the use of the World Wide Web. This presented a potential increase of e-health and CPRs. In the latter half of 2003 the National Library of Medicine licensed SNOMED-CT, an EMR standard, for use by health care organizations throughout the United States (Berner, et al., 2005).

The richness and variety of medical concepts are major barriers to formulating a widely accepted and standardized clinical vocabulary that is suitable for encoding patient-specific information in the electronic medical record (Shortliffe, 1999). However, it is generally accepted that standards are needed to allow the EHR to be used on a wide scale. The issue of standardization is expanded on Section 4.

2.2 Terminology

Because of the extemporized use of the three afore-mentioned terms (CPR, EMR and EHR) in the medical healthcare profession, there is somewhat misunderstanding and confusion between the different medical healthcare systems. Although various definitions are available from the literature, the truth is that there is no single general description that successfully classifies these three terms. The first published international EHR technical specification “ISO/TS 18308: 2004 Health Informatics-Requirements for an Electronic Health Record Architecture” contains seven different definitions drawn from four countries, each reflecting slightly different shades of meaning between different countries and organizations (Health Level Seven, Inc., 2004). The truth is that this plethora

of definitions typically has more similarities than differences and often merely constitutes a different perspective on the underlying data.

The difference between these systems is subsequently discussed.

2.2.1 The Computer-based Patient Record (CPR)

A CPR is described as a lifetime patient record that includes all information from all specialties and requires full interoperability. However this specific definition is unlikely to be achieved due to implementation issues (Waegemann, 2003).

The U.S. Department of Defense, Veterans Affairs and the Indian Health Service originally set out to create an electronic patient record by using a backbone layer that would serve as an information mediator among various legacy systems (Carter, Brown, Nelson, Lincoln, & Tuttle.). This would be called the first definition of a CPR. The CPR has also been viewed as not a product or an object. The CPR is rather described as a set of processes that are put into place and supported by technology (Shortliffe, 1999).

2.2.2 The Electronic Medical / Patient Record (EMR / EPR)

An EMR/EPR is similar to a CPR, but does not necessarily contain a lifetime record and rather focuses on relevant information. It also has full interoperability within an enterprise (hospital, clinic, practice) (Waegemann, 2003).

The EMR is sometimes described as an “alphabet soup” due to all of the various names that it has been called, some of these being Clinical Data Repository and Electronic Patient Record. The problem does not end at what to call it, but also its definition. According to the Japan Association of Medical Informatics (JAMI) a standard EMR does not cover all application areas, but must support an order transmission system and an order result reference system for all types of application areas (Japan Association of Medical Informatics, 2003). For the purpose of distinguishing the EMR from the CPR and EHR, Ondo, Wagner and Gale define it as “a complete on-line record that is accessible to all that need it when it is needed” (Ondo, Wagner, & Gale, 2002).

2.2.3 The Electronic Health Record (EHR)

An EHR is a form of electronic storage that provides instant availability of information to authorized practitioners, which includes enhanced access to medical information and greater efficiency (Waegemann, 2003). As per the scope of this research paper, the concept of EHRs will be further investigated in Section 3.

From 40 years ago until today, the electronic healthcare system has seen some tremendous advancement. But are these advancements really enough? Are health care workers content with the current systems? Currently the levels of use of EHRs is still low, although there is a heightened awareness of and interest in the technology. After expanding on the concept of EHRs in Section 3, the issue of standardization is addressed in Section 4. Section 5 investigates the factors that hamper the adoption of EHRs.

3 ELECTRONIC HEALTH RECORDS (EHRs)

3.1 Overview of EHRs

Although ISO was not able to define the EHR back in 2000, they were able to define what functions the EHR should perform. The main purpose of the EHR is to supply a standard record of care supporting present and future care by any clinician. This will be of tremendous assistance by allowing any clinician to know a patient’s prior conditions even if they are new patients.

“The EHR also has a number of secondary uses: medico-legal, quality management, education, research, public and population health, policy development, health service management and billing/finance/reimbursement” (ISO, 2002, p. 10 - 11). Another possible definition was put forward by the Electronic Health Record Taskforce in 2001. According to them, based on the

essentials that people were looking for: “An electronic health record is an electronic longitudinal collection of personal health information, usually based on the individual, entered or accepted by health care providers, which can be distributed over a number of sites or aggregated at a particular source. The information is organized primarily to support continuing, efficient and quality health care. The record is under the control of the consumer and is to be stored and transmitted securely” (Smallwood, 2001, p. 3).

One of the greatest incentives to adopting EHRs will be through reaching a critical mass of information sharing - like the first few people with telephones or electronic mail, investors in health care information technology are by and large dealing with internal information systems unable to interact with outside systems (Ash & Bates, 2005). While the adoption of this technology has been slow, it does have a number of advantages, including enhanced access to medical information (Calgary Health Region, 2003). The typical functions of an EHR are now expanded on in the form of highlighting the advantages of EHRs in general.

3.2 Advantages of EHRs

EHRs have a number of functions that will help benefit not only healthcare workers, but the patients as well.

3.2.1 Decision-Making

The EHR will assist health care providers to make decisions using the most up-to-date and precise information. Decision-making will be expedited. For example, diagnoses can be based on tests already conducted, the results of which will be retained by the EHR. The necessity of running duplicate tests will be eliminated and decisions can be made immediately. The EHR will also aid clinicians’ decision-making by providing access to patient health record information where and when they need it and by including evidence-based decision support.

EHRs contain a number of other features that help to improve decision-making. These features include an evidence-based reminder system and provision for compliance and prescription cost containment (EPC Task Force, 2005). These reminder systems have shown to significantly advance preventative practices in a number of areas. These areas include vaccinations, breast cancer screening, colorectal screening and cardiovascular risk reduction. There are even studies that show a positive effect on improving drug dosing, drug selection and screening for drug interactions (The National Academy of Sciences, 2001). This all contributes to improved health care delivery.

3.2.2 Improved Accessibility

By providing wide scale connectivity, authorized staff will be able to securely and quickly access patient information to help make decisions on patient care, wherever they need care. The EHR vastly improves the efficiency and effectiveness of the information retrieval function (EPC Task Force, 2005).

Accessibility is taken a step further by providing the patients access to their medical records. They are allowed to enter certain information into their records to help medical staff verify medical record accuracy (EPC Task Force, 2005). This recognizes input from the patient from the perspective that they can note symptoms on a regular basis to facilitate the creation of a record of how and what they feel. These notes from the patient (over time) may assist to increase the accuracy of diagnoses.

3.2.3 Time Efficiency

The EHR computerizes and reorganizes the clinician’s workflow to improve efficiency. The EHR also supports the collection of data for uses other than direct clinical care, such as billing and quality management (HIMSS EHR Committee, 2003). Gone are the days of lost patient folders and unnecessary tests, all of which optimizes time efficiency and overall quality of health care delivery.

3.2.4 Patient Safety

Patient safety is improved through keeping record of prescribed drugs, allergic reactions and any existing medical conditions to name a few (Calgary Health Region, 2003). The evidence-based reminder system helps remind medical staff about all types of disease prevention and early detection screening tests (EPC Task Force, 2005). This enhances patient safety since health care workers are constantly reminded about these tests and prevention steps to always be aware of their patients' health.

3.2.5 Enhanced Health Information Management

The EHR will enhance health information management by eliminating the need to transport records for completion and providing major reduction in storage space requirements. The evidence-based reminder system that helps with decision making is also used in health maintenance (EPC Task Force, 2005). Another way the Health Information Management is improved is the fact that the EHRs are dependant on medical knowledge. Thus the EHRs continually update the evidence-based rules that also support patient safety (EPC Task Force, 2005).

3.2.6 Enhanced Revenue Management

Revenue Management is the science and art of enhancing firm revenues while essentially selling the same amount of product (Bell, 2005, p. 5). The EHR will also help enhance revenue management by eliminating denials due to lost charges and improves the ability to justify charges (Quadramed, 2004).

3.2.7 Results Management

This advantage correlates to some of the afore-mentioned advantages. The computerized records provide easy accessibility to medical data at the time and place it is needed. Reduced lag times greatly improve time efficiency and patient safety. Patient safety is improved due to quicker recognition and treatment of medical problems. Furthermore any previous test results are displayed thus reducing redundant tests being run which helps to further reduce time wastage.

Finally electronic results can allow for better interpretations and since various providers will be linked together, critical linkages and care coordination are enhanced (The National Academy of Sciences, 2001).

The realization of all the advantages discussed in Section 3.2, are highly dependent on standardization efforts for EHR systems across the world.

4 STANDARDIZATION

The EHR is not a physical system as much as it is a concept. This concept is realized through a collection of various standards. There are three main standards bodies currently active in international standards directly related to the EHR, viz ISO (International Standards Organization), CEN (Committee European Normalization - the European Standards Organization), and HL7 (Health Level 7) that is U.S.-based but now has over 20 international affiliates (Health Level Seven, Inc., 2004).

EHR standards, as classified by an ISO EHR *ad hoc* Task Group (Health Level Seven, Inc., 2004), will be discussed in the following subsections.

4.1 Core Interoperability Standards

There are four pre-requisites that are necessary to attain interoperability of medical information within the EHR. Firstly, a standardized EHR reference model and a standardized service interface model are needed to provide functional interoperability. The reference model must provide an information architecture between the sender and the receiver of any information being sent. The service interface model will provide interoperability between the EHR system and any other

necessary components (eg access control and security services) within an inclusive clinical information system.

The other two pre-requisites are also connected. A standardized set of domain specific concept models provides archetypes and templates for various domain-specific concepts, whilst standardized terminologies support these archetypes (Health Level Seven, Inc., 2004).

Interoperability is arguably the single most important benefit of EHR standards since this is the area most lacking in health information management today (Health Level Seven, Inc., 2004).

4.2 Content Standards

Content standards are a significant group of standards that can be broken down into "content standards for the EHR" and "content standards for EHR systems" (Health Level Seven, Inc., 2004).

The content standards for the EHR includes standards for data elements including minimum data sets and disease registers, as well as standards for data element content of parts of an EHR. These content standards may also contain standards for transmission of standardized data sets. This differs from the content standards for the EHR system as these (EHR system) content standards refer to functional content of EHR systems (Health Level Seven, Inc., 2004).

4.3 Standards for EHR-related services

There are certain EHR-related services that would be better handled by Technical (TG) and Working (WG) Groups within those specific service areas. However, there are areas such as access control and consent management standards that will be handled best by a joint effort between an EHR TG/WG and a specialist TG/WG. There are other services though that are best left to the EHR TG/WGs. The main area that falls into this category is patient/clinician identification demographics (Health Level Seven, Inc., 2004).

4.4 Standards for specific EHR technologies, sectors and stakeholders

These standards often occur because of a lack of generic standards and would only be necessary to allow interoperability between specialized and generic EHR standards. There have been legitimate instances of the need for special interest versions of generic EHRs. In these instances, the underlying functional model and function set ensures compatibility as they are the same. These standards are further being extended to allow realm-specific specializations. This will allow a care profile in one country to be different from a care profile in another country (Health Level Seven, Inc., 2004).

4.5 EHR Meta Standards

The EHR Meta Standards deal with the high-level standards. The main standards include the ISO Emergency Framework, the Health Indicators Conceptual Framework, the Health Informatics Profiling Framework and an EHR Enterprise Architecture standard (Health Level Seven, Inc., 2004).

The issue of standards is receiving increasing attention and good progress is being made (Ash & Bates, 2005). There is general consensus in the health care environment that the success of the health care system (public and private) is dependent on the ability to consolidate information from a variety of sources - it is recognized that this ability is dependent on the standardization of health information (Committee on Standardization of Data and Billing Practices, 2003).

5 FACTORS AFFECTING EHR IMPLEMENTATON

5.1 Background and Statistics

The various factors and forces that influence the acceptance of EHRs differ within two settings: firstly there is the inpatient setting and then there is the outpatient setting. According to the

American College of Medical Informatics (ACMI), this distinction relates to a difference in the strength of the factors rather than the number of types (Ash & Bates, 2005).

The ACMI believe that the main area where the EHR lacks is in the actual acceptance of the EHR. In fact, after a survey was conducted in 2002 by the ACMI, 83.7% of respondents in the USA did not have anything resembling a Computerized Physician Order Entry (CPOE) system, 9.6% responded that they had CPOE fully available and 6.5% responded that CPOE was partially available. This survey also determined that most of the hospitals within the inpatient setting with CPOE were either Veteran Affairs or military hospitals. Furthermore if these hospitals are expelled from the survey, around 6% of other hospitals fully implement CPOE. Even though a comprehensive survey is not available for the outpatient setting, the level of EHR acceptance is estimated at between 5% and 39%. Further data from the HIMSS mention that there is a 10% adoption gap in the pediatric practice while there is more than a 40% adoption gap in the internal medicine practice (Ash & Bates, 2005).

5.2 Security Concerns

With consideration for the context of EHRs and various facts presented about the adoption of this technology, the focus now shifts to the fact that security is considered (at least by some) as a major barrier to the implementation of EHRs.

As recent as 2005, a man by the name of Gordon Atherley argued that there would be problems with the EHR as it is a new technology – he asserted that EHRs consume too many resources that could be used to improve healthcare service delivery or development and if public policies fail, then people within the organization will lose confidence, especially in healthcare information technology. Atherley therefore conducted a study to try to prove his arguments were correct. His study showed that the main concern about EHR adoption was security, in particular people felt that privacy and confidentiality were undermined too much and felt that this was a severe public risk. Another chief security concern was the possibility of breakdowns in security occurring during implementation.

Atherley's study concluded that the public was still enormously concerned about both security and availability issues concerning the EHR (Atherley, 2005). While his study did not intend to discover security issues, it did end up exposing people's concerns about security within the EHR. Physicians do not concern themselves with the security aspects of a program as they feel that the Information Technology department should be monitoring the security features (Ash & Bates, 2005).

Another security issue is that since the EHR is designed to provide wide-range, even remote, connectivity this leaves the EHR open to security holes and flaws. It has also been suggested that a medical information officer be appointed to understand the implementation strategies (Ash & Bates, 2005).

In another study that was initiated to determine problems during the EHR setup, some security issues were also uncovered. When the results were released, the experiment showed that there were two major security concerns: users and administrators were commonly concerned about data loss and their other concern was about privacy, as there was no reliable way to predict who would need access to the EHR and who wouldn't (Tonnesen, LeMaistre, & Tucker).

Considering the concerns relating to security and privacy as mentioned above, the rest of Section 5.2 categorizes the concerns in terms of technological, organizational and governance / legislative factors, with a view to showing that these factors must be controlled to ensure effective and secure operation of EHRs.

5.2.1 Technology Issues

As stated previously, one of Atherley's arguments was that the EHR was too new of a technology to be implemented. This is a valid point because if the medical staff does not know how to use the technology correctly, then problems can occur. Therefore the staff needs to be trained thoroughly on how to use the EHR. However training creates its own problems. While medical staff is more technologically savvy now-a-days, they will still need to be taught how to use the system. We are generally doing a poor job of training future clinicians in the role that computing and communications technology can and should play in our health-care system, and are thereby leaving them poorly equipped for the challenges and opportunities they will face in the rapidly changing practice environments that surround them (Shortliffe, 1995).

As long as training is occurring, health care workers will be taken out of the office and will not be able to perform their daily routine. This is not a unique scenario and applies to any environment where training is required. Due to time constraints, some institutions may rush the training courses, perhaps not teaching security precautions well enough. This could lead to security-related problems, such as staff leaving the system open to unauthorized people.

From a technological point of view, openness versus proprietary solutions is still debated. Some people feel strongly that all vendors should make data sharing as free as possible, while others feel that such ease of sharing could be a problem. For one thing, if data is too freely available then privacy and confidentiality concerns are raised (Ash & Bates, 2005). These issues (privacy and confidentiality) are further put at risk by the fact that individual unique identifiers are envisaged for each possible patient. These unique identifiers would not only be hard to implement, but would also bring about immense privacy concerns.

Clinics also want remote connectivity to be included in the EHR system to allow their staff to access the patient medical records from their very homes (Ash & Bates, 2005). This would create an even bigger security risk than the unique identifiers if not properly monitored. Accessing important and confidential patient information via the Internet for example may open the hospitals network to anyone with a hacking tool or hacking experience.

With regards to the technological problems, it must be ensured that any technology training that the staff may be given is run properly and at a pace that will allow all staff members to obtain a proper grasp on the EHR technology. It must also be ensured that technology (eg encryption) be used appropriately to protect information sent between medical facilities and accessed by medical staff as part of their daily work.

5.2.2 Organizational Issues

From a change management perspective, EHRs (as with any other information system) cannot be implemented without obtaining the support of medical staff and other users of the system. Resistance to change could be very problematic in terms of the success of an EHR project.

Clinicians and other users might feel that the EHR may interfere with their workflow and will not support the EHR implementation. Consequentially, if clinicians believe that management wants to try and force them into using the EHR, they may dig in their heels. This may lead to ignorance towards the use of the EHR systems by the clinicians, which may open up security holes.

Conversely, the drive towards the use of the EHR may come from other sources. If the momentum comes from the clinical staff, other clinicians may be more willing to adopt sooner, and promptness may be at a higher level. One estimate of readiness is the extent to which certain categories of people hold positions within the organization. In particular, administrators at the highest level should offer both moral and financial support as well as demonstrating that they actually believe in the patient care benefits of the systems (Ash & Bates, 2005).

The bottom line is that regardless of who initiates an EHR project, proper change

management principles must be applied.

Another question is about ownership of the EHR. In many cases EHRs are being created at the institutional level. These systems are largely funded by the institutions themselves. Secondly, a growing number of health services are being provided outside the publicly funded or government-financed system. These services are provided either by private service providers or via private insurance. There may even be a move toward individuals either administering their own EHR or hiring the services of a third party company to manage their EHR. These different possible owners do not provide full interoperability thus leading to the issue of linking these separate systems being very problematic for security reasons (Office of Health and the Information Highway Health Canada, 2001).

While the organizational concerns can prevent the adoption of the EHRs, these issues can not be blamed on the actual concept of the EHR as it should be the responsibility of the organization to deal with these problems. The organization's managers and its individuals need to come up with an agreeable solution that will suit both sides. In this way they could encourage both sides to accept the changes that an EHR would bring about.

5.2.3 Governance/Legislation Issues

While EHRs have improved technologically over the years, policies aimed to help speed up EHR implementation have not been able to keep up with these changes. The two most important policy issues that need to be agreed upon are privacy and liability.

Privacy entails a person's right to decide when, how and to what level they share their personal information. Some of these privacy concerns include what information should be included, who should have access, which information and under what circumstances should that data be shared with other health providers, how will a patient access their own records and when will the patient need to give consent. The requirement for international interoperability provides even more barriers to privacy. Adopting solutions from other countries is difficult since countries have different ways of handling privacy (Office of Health and the Information Highway Health Canada, 2001). HIPAA's own privacy standards present another alarming difficulty to the use of the EHRs. Even though the HIPAA stipulates privacy requirements in the "Privacy Rule", this rule does not predict the type of unhindered sharing of information amongst entirely distinct health care providers (Culbertson, 2005).

6 CONCLUSION

This paper investigated various points of view amongst researchers as to whether the disadvantages of health information systems outweigh the advantages with regards to security in particular. Both sides of this argument were examined through literature studies.

While it could be argued that both points of view have merit, we come to the conclusion that using concerns about the security and privacy of health information as a reason not to implement EHRs / healthcare information systems, does not carry weight.

A 1997 study by the US-based National Research Council pointed out that the major vulnerabilities of storing electronic health information are related to inappropriate use of patient-specific information by health workers who have access to those data as part of their regular work (Shortliffe, 1999). Seen in this light, the study postulates that such risks are as great or greater when data are stored in paper charts.

In a study conducted at a public hospital in the Eastern Cape, a very high percentage (95%) of staff agreed that patient folders are not readily available (Nkundla, Pottas & Eloff, 2004). This emphasizes that the availability of paper-based data continues to be a problem. A report from (Tonnesen, et al.) states that the data loss electronically has been nil, while the inability to find paper-based data continues to be a major problem.

These examples call attention to the fact that EHRs can improve the security and privacy of health information. The transformation of healthcare information systems to support greater accessibility and standardization (even across continents) is eminent. In order to ensure that adoption of the concept of EHRs improves, it is recommended that more attention is paid to implementing proper technological, organizational, governance / legislative and other relevant frameworks, to support the environment. This should dispel the misconception that security and privacy-related issues are considered as barriers to the adoption and use of EHRs.

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