ELECTRONIC MEDICAL RECORDS SYSTEM USER ACCEPTANCE

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ABSTRACT

Access to quality healthcare in developing countries must be provided amidst a resource scarce environment and often only accessible to a fraction of the population. Health information technologies (HIT) are seen as a means to improve and increase access to quality healthcare with the South African National Health Insurance strategy requiring the use of electronic based systems as an integral part of the medical information system to help ensure the success of the strategy. One such electronic based system is electronic medical records (EMR). Various studies have recognized the positive influence EMR systems should have on the perceived efficiencies of healthcare professionals and also the positive influence change management as a science can have on the change process any company has to or need to make. This paper reports on the results of a study focusing on the challenges healthcare professionals face in accepting a new EMR system and also to test if change management as a scientific field of study can be used to facilitate the changeover process from a paper based record system to an EMR system. The scope of the study was limited to the human aspects of change management and perceived efficiency of healthcare professionals. Two South African medical institutions were approached with one in the process of implementing a new EMR system and the other at the initial stages of the deployment at the time of the study. A literature review of EMR systems and in-depth study of change management were done. A narrative inquiry was performed to determine if any principles of change management has been used to facilitate the changeover to the new system. The responses of the narratives survey were analysed and compared to known principles of change management taking into consideration the complexities of EMR systems and the resulting conflicts between using the existing system and changing over to a new system as well as the perceived change in efficiency. The challenges faced by successfully implementing new EMR systems are indeed vast. There do however seem to be a common theme in most of the challenges that ultimately converge on how users experience the system and thus their resistance to the new system. Less experienced user tend to resist the change due to a lack of understanding of the system with usability of the system playing a large role. Even experienced user will resist a system if they perceive the system to be ineffective in assisting them with their primary task. Thus, based on literature and confirmed in this case study, if adoption of EMR systems is the ultimate goal, the implementation thereof should be properly managed with strong leadership and political backing at the highest level. Adoption is also supported by keeping the end goal in mind with all stakeholders, especially leadership, at all times aware and responsive to whether the change is supporting or hindering organizational goals. In this regards change management as a science can possibly play an integral part in the ultimate acceptance of EMR systems.

Keywords: Change Management; Electronic Medical Records (EMR); Organisational Change; Health Technologies

INTRODUCTION

Access to quality healthcare in developing countries must be provided amidst a resource scarce environment and often only accessible to a fraction of the population. Health information technologies (HIT) are seen by many as a means to improve and increase access to quality healthcare in developing countries and thus have shown a marked proliferating into developing countries (Chan & Kaufman, 2010:300). In South Africa the importance of having a centralised medical information system has also been recognised, as indicated by the establishment of the District Health Management Information System (DHMIS) Policy as mandated by the National Department of Health and required in terms of the National Health Act (Act 61 of 2003) (Department of Health, 2011a:13). The National Health Insurance (NHI) strategy expands the importance of medical information system by stating the use of electronic based systems to be an integral part of the system to ensure the success of the NHI strategy (Department of Health, 2011b:44).

It then needs to be questioned, why does eHealth technology systems, even if seen as an integral part of future health care, does not have a far more reaching and positive influence?

This paper reports on the results of a study focusing on the challenges healthcare professionals face in accepting a new EMR system and also test if change management as a scientific field of study can or could have been be used to facilitate the changeover process from a paper based record system to an EMR system. The scope of the study was limited to the human aspects of change management and the perceived efficiency of healthcare professionals.

BACKGROUND

By human nature change implies re-evaluating one's own concept or sense making of what constitutes the best way to achieve a set goal or task (Riesenmy, 2010:164). Managing the process of converting to an EMR system from the very early stages of recognising the need for change can thus have a profound influence in the way the new system is perceived and ultimately accepted by the intended users.

Even with all the challenges related to implementing HIT systems such as EMR systems, various organisations has successfully implemented workable systems with combined patient records numbering in the hundreds of thousands. While these systems are not complete or even ideal they can provide valuable insights why these systems worked (Fraser, Biondich, Moodley, Choi, Mamlin & Szolovits, 2005:85). By understanding the implementation process of these systems and the role change management as a science played in the implementation process, can provide valuable insight and serve as a guide for future systems.

A research study undertaken by Edwards (2006:2) revealed that during 1994 twenty to thirty percent of administration expenditure in the Danish health system was spent on the handling of paper and inefficiencies inherent in the paper-based systems resulted in errors, duplication, wasted time and poor service. This would seem to suggest that EMR systems have the potential to not only engender cost savings, but also to enhance healthcare service delivery. Although financial benefits have essentially been documented, anecdotal evidence suggests that Denmark has also achieved

significant clinical benefits from factors such as improved adherence to care guidelines, faster exchange of test results, fewer duplicate procedures and more time for clinicians to spend with patients (Edwards, 2006:2). Denmark's success in this regard, according to Edwards (2006:2), lies in a careful alignment of incentives, the creation, of a culture of collaboration, and the maintenance of a correct balance between central and local leadership. Of particular pretence in this regard therefore is the people related factors that were taken into consideration.

McCarthy and Eastman (2010:1) compare the implementation of an EMR system to a tornado that "whips through an organization, turning life upside down and throwing users into a world filled with new ways of doing things and seeking ways to recapture some sense of balance and control". It undoubtedly disrupts the status quo within an institution and the challenges faced in implementing EMR systems are numerous. The challenges range from issues relating to the purely technical, to dealing with the psychological blocks people develop. The latter assumes particular relevance in that people resist inherent changes required, based on an unsubstantiated fear of change. McCarthy and Eastman (2010:1) quite pertinently emphasize that if poorly dealt with, these challenges can be disastrous, costing the institution time, energy and money to get the implementation back on track. The key they argue is assisting users through the challenges to enable them to experience a positive transformation journey (McCarthy & Eastman, 2010:1)

As technology progress computers become more pervasive in everyday life with human-computer interaction (HCI) becoming inescapable. Even if it seems as if computers are the driving force behind even the most simple of tasks, it still remains a relatively "young" technology and also young field of scientific study (Beaudouin-Lafon, 1993:328). In the early days of computing, systems was designed by specialist for specialist with scientist finding the need for such systems as worth the cost of time and effort to learn how to use the systems (Shackel, 2009:354). Difficulties and HCI problems of non-specialists was recognised only from around the mid-1960 as computers started to become more common place and widespread use of computers only prevalent from the 1980's with portable machines finding traction in the 1990's. Prevalent use from the 1980's started to cause widespread usability problems and seen as a definite real world problem that needs to be addressed (Shackel, 2009:354).

Translating HCI problems to EMR systems, a study by McAlearney et al. (2010:810), found workers in community health centres (CHC) indicating additional workflow, as a result of newly implemented electronic health record (EHR) systems, to be a major obstacle. The study found three major categories of additional workflow (McAlearney et al., 2010:810):

- work that stems from EHR implementation,
- addressing EHR-related errors, and
- creating workarounds to address limitations of the EHR.

As a possible way of addressing HCI problems, Pols and Moser (2009:159) indicated that technologies are developed to perform or support a particular function. Performing said functions requires the technology to exist in a social and affective relation with the user, either experienced as positive or negative. By accepting and tracing the 'sociability' of especially medical technologies could thus help to elucidate why some people do or do not like to use these technologies (Pols & Moser, 2009:161) and thus help improve EMR systems and the way health professional interact and use the systems.

The challenges and needs faced by health institutions can be vastly different based on whether the organisation is located in a developing or developed country with cultural factors and issues such as lack of computer skills playing a large role (Scholl, Syed-Abdul & Ahmed, 2011:958).

Organisational culture plays an important role on how any new technology is accepted and the level of resistance to the new technology. The importance of organisational culture stems from the fact that the concept serves as perceptual and behavioural determinants (Imran, Saeed, Anis-ul-Haq & Fatima 2010:3337; Weeks & Erasmus, 2013:41). In this regard Wright (2011:38) quite explicitly argues that "the organisational culture and climate should also be taken into account as it will determine the resistance to change which can be expected". The level of resistance does tend to be less when physicians are constantly exposed to an innovative environment where knowledge and skills through hands-on experience are emphasized (Riesenmy, 2010:164). Scholl et al. (2011:961) support this theory as they found staff interviewed in their study was reluctant to change with two of the 10 optometrists interviewed indicating never to have used a computer before.

Patel, Arocha and Kushniruk (2002:8) argue that there exists a difference in the way that physicians represent medical problems and how the patients experience and relate the underlying symptoms. Physicians mostly represent disease in terms of the biomedical knowledge they have of the underlying disease, whereas patients relate how they feel in terms of a narrative explanation of the illness. Patel et al. (2002:8) state the difference between disease and illness as follow:"… disease is the dysfunction of the body, whereas illness is the social and moral meaning attached to this dysfunction that involves the disruption of the patient's normal life." The EMR system studied by Patel et al. (2002:15) typically limited data to discrete units of biomedical knowledge that's recorded according to physician-centred medical findings and information. Loss of information thus becomes apparent when compared to paper records that allow information to be freely captured in a less structured way and thus able to better represent the narrative explanation as provided by the patient.

Given the study done by Patel et al. (2002), it can be surmised that there exist a conflict between different stakeholders what constitute valid information and how the information is stored by the EMR system. This implies that the changeover to an EMR system should be properly managed from the very early stages of identifying the need for change and not at the start of the implementation phase. By accomplishing this, the EMR system is designed to fit the needs of the institution and stakeholders it is supposed to benefit. Modularity however still remains important to facilitate possible future integration of the EMR system into a larger network.

By human nature change implies re-evaluating one's own concept or sense making of what constitutes the best way to achieve a set goal or task (Riesenmy, 2010:164). Riesenmy (2010:169) relates sense making for physicians, to the emotional arousal and outside influences that will ultimately help them either accept or reject any EMR systems. Furthermore, physicians have also been slow to adopt EMR technology due to the believe that the new technology will have a negative effect on their medical practice with aspects of cost, support and ability to use the new systems being cited as reasons (Riesenmy, 2010:164). Riesenmy (2010:164) continued by stating that physicians would be less likely to assimilate EMR systems when there was a difference between what they expected from the implementation and to what eventually transpired due to the implementation and the resulting level of difficulty involved.

Management theory and practice, as a science, has over the past two decades been dominated by studies related to organisational change (Thurlow & Mills, 2009:459) with proper management of change seen as crucial and inevitable to the survival of any organisation. The underlying assumption and message of a plethora of works, indicating change "should, can and must" be managed (Sturdy & Grey, 2003:653). Leaders that anticipate the change and react rapidly and responsibly tend to be very successful with organizational leaders that not only anticipate but rather invent the future, becoming the leaders of their selected industry and thus the most successful by setting the pace for followers. Organisations that negate their responsibility to adapt to change tend not to survive (Pryor et al., 2008:1).

Change can be either revolutionary or evolutionary. Evolutionary changes tend to be reactive in nature as a result of external factors acting on the organisation Change in a reactive organisation tends to take on the form of sporadic or continuous improvement initiatives (Pryor et al., 2008:2). Revolutionary changes on the other hand is a radical movement that transforms the organisations to such an extent that change becomes an on-going process (Pryor et al., 2008:3). Revolutionary change in organisations makes the organisation the driving force of change in there macro-environment

Pryor et al. (2008:16) discuss various change management models with the belief that most of the models are still relevant in today's era with the exception of the speed at which the models need to be implemented. Notwithstanding the tempo of changes, organizations in the current era also has to deal with unprecedented levels of change in terms of type, quantity, complexion and immediate communication of the change throughout the world and thus requires immediate and accurate responses to changes (Pryor et al., 2008:3).

Pryor et al (2008:11) highlights, what they believe to be the core concepts of change management as found by a literature study of different change management models:

- A need for the change must be established. If there is no need to change, your personnel will not want to change.
- Change requires strong organisational leadership that will be able to drive the need for change.
- A new vision or business result must be developed and a movement created in the direction of this new vision or business result. Again strong leadership is required that will live the new vision or business result to create a strong sense of trust among the personnel by leading by example.
- Empower your personnel by providing them with the necessary tools to facilitate the change and also creating a safe environment where personnel will be safe in the knowledge that they are valued and needed. Leadership should constantly monitor and evaluate current systems, processes and capabilities to facilitate change and a healthy work environment.
- Change should be reinforced and constantly evolve to fit the needs of the organisation. Leadership should constantly look for small improvements to encourage additional change.
- Support the change throughout the change process. People respond differently to change and while some will openly embrace the change many others will strongly resist the change, especially during the development phases of the change. Leadership should understand the resistance to change and support personnel by implementing the necessary strategies to allow personnel to work through their resistance and ultimately support the change.

- Personnel should be included in the change process as facilitators and not limited to merely implementers of the change. Planning in an organisation should be extended to be both vertically and horizontally inclusive to ensure as many stakeholders as possible can be included in the change process. “When a plan is viewed as everyone’s plan, it can be embraced by everyone” (Pryor et al., 2008:12).
- Strong communication throughout the organization is required to gain support for the change.
- Change should constantly be measured and monitored and accountability established.
- Strong leadership, even if included in many of the points, warrant to be addressed separately. Transformational leader should have the ability to assess their environment, know the vision of the company and effectively convey and find support for the vision and ultimately execute the vision with a proper plan in place.

METHOD

Two South African medical institutions were approached with one in the process of implementing a new EMR system and the other at the initial stages of the deployment at the time of the study. Each had its own unique characteristics and approach in realising the EMR system.

Using Pryor et al (2008:2), the changeover to an EMR system is driven by government (macro-environment) requiring quality healthcare to be available to all through the NHI strategy (Department of Health, 2011b:44) and thus EMR systems in state funded institutions in South Africa tend to be more evolutionary than revolutionary with the need for change driven by their macro-environment.

A need for change has thus been created by the macro-environment through a mandate by government to ensure proper healthcare be available to all (Department of Health, 2011b:44). Thus the first principle of change management has been established.

The challenge of the study was found to be connecting the rest of the principles of change management as found by Pryor et al (2008:7) to challenges faced by EMR systems.

The study focused on the human aspects of the changeover to an EMR system to improve efficiency and the role change management played in the acceptance of said system. As the study related to human aspects, it was decided the study would be better suited if the research took on the form of a qualitative study by means of a narrative inquiry. As such the research methodology was essentially analytically descriptive and not statistical in nature.

According to Clandinin and Huber (2010:3) a narrative inquiry is a way of understanding and inquiring about the experience of the participants through a process of collaboration between the researcher and the participants of the study.

Narrative inquiries have three dimensions in common, namely the temporality of the information, the sociality of the study and the place where the interview is set (Clandinin & Huber, 2010:3). Careful consideration must be given to the three dimensions as together they allow the researcher to study the relational composition of the participant’s experience.

Even if Narrative inquiries do comply with the legal and procedural aspects of ethics as held by institutional research boards, careful consideration should be given to the ethical nature of the relational aspects of a narrative inquiry (Clandinin & Huber, 2010:15).

Clandinin and Huber (2010:15) define ethical consideration in narrative inquires as the negotiated responsibility between participants and researchers with the research keeping a level non-judgemental tone during the inquiry. The responsibility is also understood to be long term as the lives of both the participants and the researcher keeps unfolding and evolving while the text of the study is written and thus must respectfully relate the lives lived and stories told as a living story that represent who the participants are and continually evolve into.

As the study relate people's lives that are still in the process of unfolding, issues of anonymity and confidentiality may take on added responsibility as the study can reflect the most inner personal thoughts of the participants (Clandinin & Huber, 2010:15). As such fictionalising or blurring of identities may often occur as part of an increased attentiveness of ethical matters (Clandinin & Huber, 2010:15). As alluded to the importance of ethics and the need of keeping respondent's names confidential was taken into consideration and used.

Research objectives

Various studies have recognised the positive influence EMR systems should have on the perceived efficiencies of health professionals and also the positive influence change management as a science can have on the change process any company has to or need to make.

The rationale behind the study is to elucidate the challenges faced by health professionals in accepting new EMR systems and test if change management as a scientific field of study can be used to facilitate the changeover from a paper based system to an EMR system.

Defining the Scope of study

The primary objective of the research study was to gain insight into the challenges that health professionals face in accepting EMR systems and determining how these may best be addressed. As such the scope of the study was limited to:

- the human aspects of change management,
- perceived efficiency of health professionals, as determined by their buy-in and acceptance of the system, and
- exclude the physical implementation of the system to the extent of only incorporating the ultimate use and acceptance of the system by the health professionals they are intended to assist.

The challenges faced by EMR systems are indeed vast. There do however seem to be a common theme in most of the challenges that ultimately converge on how users experience the system and thus their resistance to the new system. At the core, the literature study two technical aspects has been identified that can be directly related to the level of acceptance of the system.

- Integration of the system and amount of input required by the health professional to capture the required data. This relates directly to additional workflow required by health professionals to perform their daily tasks.
- Usability of the system and if the information captured can be effectively used by health professionals at a later date. This relates to how health professionals perceive the system as either useful or just another wasteful task that has to be performed.

Independent from the technical difficulties faced by EMR systems, three social aspects have been recognised as critical and how health professionals perceive the system.

- Resistance to EMR systems due to health professionals lacking knowledge, skill or experience in relation to EMR systems and computers in general. This can be especially daunting aspect in developing countries where technology have limited penetration into the markets.
- Resistance to the EMR system due to a lack of proper consultation and integration. In the end it does not matter how good a system is designed or how useful the system can be. If health professional does not feel part of the change or lack adequate support in implementing the change, they will resist the change.
- Resistance to EMR systems due to a lack of communication. EMR systems, whether founded or not, sometimes do have a negative image with health professionals. Proper consultation and inclusion through open communication can address many of the concerns and in some instances help improve the system.

The scope of the study has thus been limited to five known challenges faced by health professionals and a core set of change management principles as highlighted by Pryor et al (2008:11).

RESEARCH METHODOLOGY

Although early days, the first institution, Institution A, implemented an EMR system that shows much potential, especially given the relatively short time the system was active at the time of the interview. The EMR system is also the second implementation of its kind with the first, implementation, fulfilling the role of the pilot project at another institution.

The second institution identified, Institution B was still in the process of implementing the new EMR system. As the current stage of the implementation when the research was conducted, was limited to only registering patients on the system, the personnel of the clinic had very little exposure to the system. As such the data analysis was primarily limited to Institute A with Institution B used to highlight some of the challenges faced by public health care institutions.

From the data gathered a profile has been built of both the paper based and EMR system of Institution A. The main similarities and differences are indicated below.

- Visiting patient reports to reception. If it is the patient's first visit, a new patient record is created and assigned a unique number used for filing and database management purposes. The patient is handed a patient folder that will be used to record the patient history. After the visit the patient hands the record back to reception.
    - Paper system: The patient record is filed according to the patient's unique number. The record is only sorted partially in blocks using the first couple of digits of the patient number.

  - EMR System: The patient record is scanned, automatically sorted and added to the EMR system by means of an added document barcode and also patient barcode that was added to the document. The hardcopy of the document is then handled the same as the paper record.

- Existing patient's reports to reception. Database lookup determine patient's unique number.
  - Paper system: A "document runner" is sent to find the patient file with the patient waiting until the document runner returns with the patient file which can take a substantial amount of time. After the visit the patient hands the record back to reception with the record again only partially filed and sorted according to the patient's unique number.
  - EMR system: The patient is handed an empty episode folder with only basic patient information that can be used to retrieve the complete patient history from the EMR system. After the visit, new paper records added to the episode folder is handed back to reception. The episode folder is scanned, automatically sorted and added to the EMR system as previously. The episode folder is then added to the existing hard copy of the patient record.

Given the sheer number of patients that visit the hospital, it is not a far stretch of the imagination the amount of time that may be needed to retrieve a patient's record in the paper based system and also the fact that patients carry their own files, a fare possibility exists of pages or even whole records being lost.

After various consultations with different stakeholder and building on experience, it was decided for the interim to limit the EMR system to electronically capturing new paper based records by means of a document scanner with pages of the patient file saved as Portable Document Format (PDF) files. Current standards already exist for the different types of paper based documents and by making minor adjustments to the format of these documents and also adding a unique barcode to each document, allows the documents to be scanned easily and then automatically sorted according to the added barcode. As each patient is already assigned a numeric number used by the paper based record system, a simple process of adding a printed barcode with the patient's unique number to each page allows the documents to be automatically assigned to the correct patient in the EMR record system with a human operator only needing to check every document scanned to ensure the barcodes of each document was captured and decoded correctly.

Given the amount of existing patients, the cost of scanning old files will be exorbitant which resulted in the decision being made to scan existing records on demand when a patient not already registered on the system visits or makes an appointment to visit the hospital.

FINDINGS

After careful analysis of the data and comparing it to the literature survey, some common denominators was found between the challenges faced by previously implemented EMR systems and also known principles of change management. The results are tabulated in

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Table **Error! No text of specified style in document.**-2.

*Table **Error! No text of specified style in document.**-1: Common denominators found between known principles of change management and data gathered for Institution A.*

Known change management principle from literature review	Change management principle found in data gathered
A need for the change must be established. If there is no need to change, your personnel will not want to change.	The need for the change in this instance is a need to improve on the services provided to patients that is dependent on public health care and not such a clear advantage to the hospital staff themselves. As Respondent A (2013) indicated they needed to find the right "hook" for every hospital department to instil the need or even just acceptance of the change. In this regard it does seem as if the need for change has been found to be important and also actively used to convince the hospital staff to use the new EMR system.
Change requires strong organisational leadership that will be able to drive the need for change.	This principle was found to be very important for the new EMR implementation at Institution A with much time and effort invested by the vendor to ensure the leadership accepted and wanted the change and also actively participated in driving the need for change.
Empower your personnel by providing them with the necessary tools to facilitate the change and also creating a safe environment where personnel will be safe in the knowledge that they are valued and needed.	The use of this principle while not clear cut does seem to have been used at Institution A with much consideration taken in the way the EMR system was implemented and also the way the training and initial support has been approached. This helped to ensure hospital staff had the necessary support in the use of the system.
Support the change throughout the change process.	The vendors of the EMR system understood the concept of needing to support the change process and invested many hours to support and overcome any resistance to the new EMR system.
Personnel should be included in the change process as facilitators and not limited to implementers of change only.	As Respondent A (2013) indicated, a top down, bottom up approach was taken to ensure as many of the stakeholders was part of the development of the EMR system with lots of man hours invested into top management as well as the different departments in the hospital.
Strong communication throughout the organization is required to gain support for the change.	Respondent A (2013) as previously mentioned found the implementation of the EMR system to be a very hands on approach with much time and effort invested to ensure the different departments within the hospital was aware of all the changes that's going to take place.
Change should constantly be measured and monitored and accountability established.	Although a very important principle, Respondent A (2013) did find this to be a bit of a grey area with many different stakeholders expecting different results from the EMR system implemented. Contractual deliverables also focused on the implementation of the system rather than the outcomes of the system. From the respondents (Respondent A, 2013) perspective, while not explicitly indicated as a deliverable, found reduction of patient

Known change management principle from literature review	Change management principle found in data gathered
	waiting times at the hospital of the pilot EMR implementation to be one of the biggest advantages of the EMR system when viewed from the ground level with patients having to wait shorter times are more happy patients which in turn improves the working conditions of hospital personnel as they have to deal with less disgruntled patients.

*Table **Error! No text of specified style in document.**-2: Common denominators found between existing EMR systems and data gathered.*

Challenges identified from literature review	Challenges identified from data gathered.
Resistance to EMR systems due to health professionals lacking knowledge, skill or experience in relation to EMR systems and computers in general.	The challenge relating to Information and Communication Technology (ICT) skills did show commonalities with many of the hospital and clinic staff having very little exposure to technology and computers. A very interesting aspect found during the research was that using a computer is not the same as being computer literate and any analysis prior to implementation should be done carefully to distinguish between computer use and computer literacy.
Integration of the system and amount of input required by the health professional to capture the required data and then retrieve the information.	Respondent A (2013) also found a correlation between the acceptance of the EMR system by medical personnel and ease of use of the system and put it to good use when designing the new EMR system.
Resistance to the EMR system due to a lack of proper consultation.	Institution A in the opinion of this researcher fared much better in taking heed of this by consulting and keeping up to date different stakeholder on a continual bases. Many of the staff in Institution B knew but did not show any real insight into the system or could provide much detail how the system was going to be implemented.

In Institution A it was found many of the hospital staff were if not happy at least comfortable with the idea having to use the new EMR system with the bigger shock only being realised later when they would have to actually use the system. The solution to convincing the hospital personnel to use the system was in implementing a halfway solution that will not have a major impact on the way the hospital has always functioned as the technology and infrastructure will not allow the complete removal of paper. The change process to the new EMR system also showed strong indications of being properly managed with hospital staff kept up to date on a continual base.

The EMR system had specific contractual deliverables that could be used to determine the success of the system. In the end an unlikely outcome of the system was to the respondent's (Respondent A,

2013) opinion a far better indicator of the success of the system, namely patient waiting times. While not a specific outcome, it was found during the research and the implementation of the pilot EMR system, the single biggest complaint for public health care to be patient waiting times with the average waiting time for hospitals in the Eastern Cape province of South Africa found to be in the region of 3 to 4 hours just to get your patient file and then additional waiting times wherever you need to go inside the hospital.

The strength of the new EMR system is not giving the patient their file but rather an empty episode folder for that specific visit with the new records in the episode folder added to the EMR system when the folder is handed back to the hospital.

If patient waiting times is thus used as indicator of the success of the system, then reducing patient waiting times should be the aim of any new system. In that respect Respondent A (2013) believe the new EMR system to be a major success as the reception area of the hospital where the pilot EMR system was implemented, being far less congested than any institution of similar size.

A secondary advantage of the new system is a reduction of lost records as the chances of a paper based patient records being misplaced or lost very small as the patient does not carry the complete record with them anymore with a digital copy of the patient record always available in case the original is accidentally lost or misplaced. As the loss of records is reduced, a real chance of reducing legal cost exist as the hospital will no longer have to deal with lawsuits and unable to provide a complete record of the patients visit to disprove any claims made against the hospital.

Institution B while having a vastly different need from an EMR system faces an uphill battle to implementing the new EMR system given the institution is reliant on the new EMR system being funded from an external source and thus would have to accept the new EMR system as is rather than customising the EMR system to the needs of the clinic. The clinic furthermore seems to lack strong leadership due to the clinic being supported and managed by various organisations, each with its own culture and way of doing things which in turn creates uncertainty with personnel what exactly is expected from them.

The general lesson learned from Institution A:

- A proper analysis of the needs of any institution must be done to fully realise what would be expected from the new EMR system to ensure the general success of the system in public health care institutions.
- Dealing with constant changes in deadlines is a reality any system will face when generally dealing with state funded institutions and public health care in general.
- Clear communication with the different stakeholders is of utmost importance with Respondent A (2013) indicated they sat in on various meetings with different hospital departments to keep them up to date on the status of the new EMR system and also asking the opinion of personnel of the functions discussed and thus including them in the design process.
- For any project to be successful, you must have the support of senior management with senior management also needing to provide a clear vision and strong leadership.
- Respondent A (2013) also indicated they found managing the changeover process for the health profession a very “hands on” exercise requiring many hours of face to face time.

- The respondent (Respondent A, 2013) found the medical field functioned very different from other fields in the sense of being a very personal experience which also translate to the way the medical field is managed. This also required the changeover process to be managed on a very personal level needing buy in from everybody with each department being approach separately taking into consideration how the system can make a difference to their specific job.
- Responded A found it is very prudent to approach ICT support, at least in the very beginning, very proactively as it was found if the support was not immediately available hospital personnel would merely bypass the system as they did not have the time to wait for ICT support to solve their problem.
- If system integration is a requirement of the EMR system, Respondent A (2013) believes a mandate to integrate should be instilled in both parties that need to integrate for any system integration to be truly successful.
- True increase in efficiency can only be achieved by system integration and it is the believe of the respondent (Respondent A, 2013) the EMR system could in future have a dramatic effect on efficiency if the EMR or more broadly the Electronic Content Management (ECM) system, acts as a centralised hub that hospital staff can use to look up all the data of patients records from a centralised point instead of needing to log into various systems to be able to view all the patient records.
- Any EMR system should be kept as simple as possible to assist personnel with limited ICT skills in operating the system. Sometimes the use must be limited to only what was absolutely needed rather than to what is possible if the latest technology is used.
- The respondent (Respondent A, 2013) also found that Institution A as a tertiary training hospital did shows signs of having a split personality when it came to ICT skills. On the one hand the relatively young doctors that grew up with technology showed a real eagerness for new technology while much resistance and hostility towards technology was found from the administrative clerks and hospital nurses.
- Even if using a computer routinely during a normal working day, it still does not constitute being computer literate at all. The administrative staff from the respondents (Respondent A, 2013) experience showed a unique characteristic as many of them used computers routinely during their normal working day while not being computer literate at all and learned there job by rote by observing another person completing the computer related task and then memorising the steps needed to complete the task without any real understanding of the process involved in what they have done. As an example to explain this statement, the respondent (Respondent A, 2013) indicated when observing administrative personnel completing computer task, many were unable to complete the task if the computer was not already setup and ready at the correct start position or if they accidentally accessed the wrong menu function could not correct the mistake. Having a false sense of the real computer literacy can prove to be a real challenge to the new EMR system which could result in personnel using the system becoming negative about the system while incurring additional costs and unforeseen delays to revise and rectify the previous incorrect assumption.

- The true success of any EMR system if viewed from a patient centric view needs to directly improve the experience patients have of public health care.

The general lesson learned from Institution B:

- Personnel if exposed to a previously failed EMR system would be exceptionally biased negatively to any new EMR system.
- Health care institutions supported by various non-profit organisation and institutions tend to lack clear leadership with a clear vision and goal to drive the change process for the new EMR system.
- If the health care institution is dependent on mostly student or volunteer support, can cause the institution to have a relatively high turnover rate of personnel which complicates staff training as a large number of staff required training on a continual bases.
- Even if any EMR system will be very useful to senior management and the government in directing state resources where needed, it should always be realised if people on ground level does not see the advantage of the EMR system and use the system, there will be no data available for senior managers and government to analyse. The change process should thus be a top down bottom up approach to ensure buy in from all hospital staff and finding the key "hook" for every stakeholder of utmost importance.

CONCLUSIONS AND RECOMMENDATIONS

In general the two institutes studied have been found to have vastly different operating conditions and needs that would have to be addressed by any new EMR system. Both in general do have to overcome very similar challenges of limited ICT skills with many of the staff needing to be convinced the new EMR system will have a positive influence to the benefit of the patients, staff and institution.

A very interesting detail found was the difference between computer use and being computer literate. The administrative staff from the respondents (Respondent A, 2013) experience showed a unique characteristic as many of them used computers routinely during their normal working day while not being computer literate at all. The respondent (Respondent A, 2013) found that many of the administrative staff learned there job by rote by observing another person completing the computer related task and then memorising the steps needed to complete the task without any real understanding of the process involved in what they have done. As an example to explain this statement, the respondent (Respondent A, 2013) indicated when observing administrative personnel completing computer task, many were unable to complete the task if the computer was not already setup and ready at the correct start position or if they accidentally accessed the wrong menu function, they could not correct the mistake and complete the memorised steps of the task.

Having a false sense of the real computer literacy can prove to be a real challenge to the new EMR system which could result in personnel using the system becoming negative about the system while incurring additional costs and unforeseen delays to revise and rectify the previous incorrect assumption.

The new EMR implementation for Institution A is a very innovative solution taking into consideration many of the challenges faced by EMR systems. What in the view of the researcher does really distinguish the EMR system from other solutions is the way the change process was implemented.

The vendor did a careful analysis of the challenges faced, customised the solution to fit the needs of the hospital and in general the prevalent conditions in South African hospitals. The vendor also showed insights in the working of the health sector and used this to the advantage of the change process.

Given the literature survey and the research undertaken, there do seem to be a real world need to properly manage the changeover process to any new EMR system as the use of technology is not only seen as a way of effectively using limited resources (Chan & Kaufman, 2010:301) but also mandated by the South African government as part of the NHI strategy (Department of Health, 2011b:44).

Translating the findings of this study to the research objectives, it was found that establishing what constitutes efficiency to be a far more complex question than originally anticipated as different stakeholders will relate very differently as to how efficiency should be measured with most relating efficiency in terms of what is important to them. In this regard, some of the administration personnel at Institution A will claim no efficiency has been achieved as their work load rather increased than decreased. Doctors and other health professionals inside the hospital may claim either a slight improvement or no change at all as their daily task has to a large extent not changed at all. The true winners in terms of efficiencies gained as indicated by Respondent A (2013) would be the patients visiting the hospital as patient waiting times has been reduced dramatically at the hospital of the pilot EMR system when compared to similar institutions.

Originally the study intended to determine the success of the EMR system based on the perceived efficiency of health professionals as related to their buy-in and acceptance of the system. As different stakeholders expect different results from the EMR system, limiting efficiency to health professionals may not truly reflect the ultimate goal of EMR systems in improving health care. On conclusion of the study, it was found that the ultimate function of public health care which is serving the medical needs of the public may be a better indication of the success of the system. The Human factor should however never be ignored as the system will not be able to function properly if not if not accepted by all the stakeholders of the system. If patient waiting times is thus used as a measure of efficiency, it is the opinion of the researcher that a correlation exists between the EMR implementation at Institution A and the efficiency achieved. As institution B is still in the early stages of the changeover process, it is difficult to relate if any efficiency has been achieved as the EMR system was at the time of the study still limited to registering new patients on the system and has not reached the core function of the clinic namely providing health services to the public.

Institution A does show strong signs that change management as a science has been used during the changeover process and in the belief of the researcher did have a real world impact on the effectiveness of the EMR system. It was found that Institution B has not taken such direct cognizance of change management as a science. As the EMR implementation is still in the early stages of the implementation process, it is difficult to determine if and what impact it may have on the EMR system once the system have been fully deployed.

The limitations set to the scope of the study has been found to be relevant with the possible exception of rather needing to define efficiency in term of the patients visiting the institution as any efficiencies gained or lost at the different points of the health care chain, will ultimately translate to the how patients perceive and experience the health care system. Moreover if efficiency has to be

limited to a single criteria, Respondent A found patient waiting times to be one of most complained about problems in South African public health care and thus may be used as a more effective measure of efficiency to determine if a EMR system constitute improved efficiency.

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ELECTRONIC MEDICAL RECORDS SYSTEM USER ACCEPTANCE

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ABSTRACT

Access to quality healthcare in developing countries must be provided amidst a resource scarce environment and often only accessible to a fraction of the population. Health information technologies (HIT) are seen as a means to improve and increase access to quality healthcare with the South African National Health Insurance strategy requiring the use of electronic based systems as an integral part of the medical information system to help ensure the success of the strategy. One such electronic based system is electronic medical records (EMR). Various studies have recognized the positive influence EMR systems should have on the perceived efficiencies of healthcare professionals and also the positive influence change management as a science can have on the change process any company has to or need to make. This paper reports on the results of a study focusing on the challenges healthcare professionals face in accepting a new EMR system and also to test if change management as a scientific field of study can be used to facilitate the changeover process from a paper based record system to an EMR system. The scope of the study was limited to the human aspects of change management and perceived efficiency of healthcare professionals. Two South African medical institutions were approached with one in the process of implementing a new EMR system and the other at the initial stages of the deployment at the time of the study. A literature review of EMR systems and in-depth study of change management were done. A narrative inquiry was performed to determine if any principles of change management has been used to facilitate the changeover to the new system. The responses of the narratives survey were analysed and compared to known principles of change management taking into consideration the complexities of EMR systems and the resulting conflicts between using the existing system and changing over to a new system as well as the perceived change in efficiency. The challenges faced by successfully implementing new EMR systems are indeed vast. There do however seem to be a common theme in most of the challenges that ultimately converge on how users experience the system and thus their resistance to the new system. Less experienced user tend to resist the change due to a lack of understanding of the system with usability of the system playing a large role. Even experienced user will resist a system if they perceive the system to be ineffective in assisting them with their primary task. Thus, based on literature and confirmed in this case study, if adoption of EMR systems is the ultimate goal, the implementation thereof should be properly managed with strong leadership and political backing at the highest level. Adoption is also supported by keeping the end goal in mind with all stakeholders, especially leadership, at all times aware and responsive to whether the change is supporting or hindering organizational goals. In this regards change management as a science can possibly play an integral part in the ultimate acceptance of EMR systems.

Keywords: Change Management; Electronic Medical Records (EMR); Organisational Change; Health Technologies

INTRODUCTION

Access to quality healthcare in developing countries must be provided amidst a resource scarce environment and often only accessible to a fraction of the population. Health information technologies (HIT) are seen by many as a means to improve and increase access to quality healthcare in developing countries and thus have shown a marked proliferating into developing countries (Chan & Kaufman, 2010:300). In South Africa the importance of having a centralised medical information system has also been recognised, as indicated by the establishment of the District Health Management Information System (DHMIS) Policy as mandated by the National Department of Health and required in terms of the National Health Act (Act 61 of 2003) (Department of Health, 2011a:13). The National Health Insurance (NHI) strategy expands the importance of medical information system by stating the use of electronic based systems to be an integral part of the system to ensure the success of the NHI strategy (Department of Health, 2011b:44).

It then needs to be questioned, why does eHealth technology systems, even if seen as an integral part of future health care, does not have a far more reaching and positive influence?

This paper reports on the results of a study focusing on the challenges healthcare professionals face in accepting a new EMR system and also test if change management as a scientific field of study can or could have been be used to facilitate the changeover process from a paper based record system to an EMR system. The scope of the study was limited to the human aspects of change management and the perceived efficiency of healthcare professionals.

BACKGROUND

By human nature change implies re-evaluating one's own concept or sense making of what constitutes the best way to achieve a set goal or task (Riesenmy, 2010:164). Managing the process of converting to an EMR system from the very early stages of recognising the need for change can thus have a profound influence in the way the new system is perceived and ultimately accepted by the intended users.

Even with all the challenges related to implementing HIT systems such as EMR systems, various organisations has successfully implemented workable systems with combined patient records numbering in the hundreds of thousands. While these systems are not complete or even ideal they can provide valuable insights why these systems worked (Fraser, Biondich, Moodley, Choi, Mamlin & Szolovits, 2005:85). By understanding the implementation process of these systems and the role change management as a science played in the implementation process, can provide valuable insight and serve as a guide for future systems.

A research study undertaken by Edwards (2006:2) revealed that during 1994 twenty to thirty percent of administration expenditure in the Danish health system was spent on the handling of paper and inefficiencies inherent in the paper-based systems resulted in errors, duplication, wasted time and poor service. This would seem to suggest that EMR systems have the potential to not only engender cost savings, but also to enhance healthcare service delivery. Although financial benefits have essentially been documented, anecdotal evidence suggests that Denmark has also achieved

significant clinical benefits from factors such as improved adherence to care guidelines, faster exchange of test results, fewer duplicate procedures and more time for clinicians to spend with patients (Edwards, 2006:2). Denmark's success in this regard, according to Edwards (2006:2), lies in a careful alignment of incentives, the creation, of a culture of collaboration, and the maintenance of a correct balance between central and local leadership. Of particular pretence in this regard therefore is the people related factors that were taken into consideration.

McCarthy and Eastman (2010:1) compare the implementation of an EMR system to a tornado that "whips through an organization, turning life upside down and throwing users into a world filled with new ways of doing things and seeking ways to recapture some sense of balance and control". It undoubtedly disrupts the status quo within an institution and the challenges faced in implementing EMR systems are numerous. The challenges range from issues relating to the purely technical, to dealing with the psychological blocks people develop. The latter assumes particular relevance in that people resist inherent changes required, based on an unsubstantiated fear of change. McCarthy and Eastman (2010:1) quite pertinently emphasize that if poorly dealt with, these challenges can be disastrous, costing the institution time, energy and money to get the implementation back on track. The key they argue is assisting users through the challenges to enable them to experience a positive transformation journey (McCarthy & Eastman, 2010:1)

As technology progress computers become more pervasive in everyday life with human-computer interaction (HCI) becoming inescapable. Even if it seems as if computers are the driving force behind even the most simple of tasks, it still remains a relatively "young" technology and also young field of scientific study (Beaudouin-Lafon, 1993:328). In the early days of computing, systems was designed by specialist for specialist with scientist finding the need for such systems as worth the cost of time and effort to learn how to use the systems (Shackel, 2009:354). Difficulties and HCI problems of non-specialists was recognised only from around the mid-1960 as computers started to become more common place and widespread use of computers only prevalent from the 1980's with portable machines finding traction in the 1990's. Prevalent use from the 1980's started to cause widespread usability problems and seen as a definite real world problem that needs to be addressed (Shackel, 2009:354).

Translating HCI problems to EMR systems, a study by McAlearney et al. (2010:810), found workers in community health centres (CHC) indicating additional workflow, as a result of newly implemented electronic health record (EHR) systems, to be a major obstacle. The study found three major categories of additional workflow (McAlearney et al., 2010:810):

- work that stems from EHR implementation,
- addressing EHR-related errors, and
- creating workarounds to address limitations of the EHR.

As a possible way of addressing HCI problems, Pols and Moser (2009:159) indicated that technologies are developed to perform or support a particular function. Performing said functions requires the technology to exist in a social and affective relation with the user, either experienced as positive or negative. By accepting and tracing the 'sociability' of especially medical technologies could thus help to elucidate why some people do or do not like to use these technologies (Pols & Moser, 2009:161) and thus help improve EMR systems and the way health professional interact and use the systems.

The challenges and needs faced by health institutions can be vastly different based on whether the organisation is located in a developing or developed country with cultural factors and issues such as lack of computer skills playing a large role (Scholl, Syed-Abdul & Ahmed, 2011:958).

Organisational culture plays an important role on how any new technology is accepted and the level of resistance to the new technology. The importance of organisational culture stems from the fact that the concept serves as perceptual and behavioural determinants (Imran, Saeed, Anis-ul-Haq & Fatima 2010:3337; Weeks & Erasmus, 2013:41). In this regard Wright (2011:38) quite explicitly argues that "the organisational culture and climate should also be taken into account as it will determine the resistance to change which can be expected". The level of resistance does tend to be less when physicians are constantly exposed to an innovative environment where knowledge and skills through hands-on experience are emphasized (Riesenmy, 2010:164). Scholl et al. (2011:961) support this theory as they found staff interviewed in their study was reluctant to change with two of the 10 optometrists interviewed indicating never to have used a computer before.

Patel, Arocha and Kushniruk (2002:8) argue that there exists a difference in the way that physicians represent medical problems and how the patients experience and relate the underlying symptoms. Physicians mostly represent disease in terms of the biomedical knowledge they have of the underlying disease, whereas patients relate how they feel in terms of a narrative explanation of the illness. Patel et al. (2002:8) state the difference between disease and illness as follow:"… disease is the dysfunction of the body, whereas illness is the social and moral meaning attached to this dysfunction that involves the disruption of the patient's normal life." The EMR system studied by Patel et al. (2002:15) typically limited data to discrete units of biomedical knowledge that's recorded according to physician-centred medical findings and information. Loss of information thus becomes apparent when compared to paper records that allow information to be freely captured in a less structured way and thus able to better represent the narrative explanation as provided by the patient.

Given the study done by Patel et al. (2002), it can be surmised that there exist a conflict between different stakeholders what constitute valid information and how the information is stored by the EMR system. This implies that the changeover to an EMR system should be properly managed from the very early stages of identifying the need for change and not at the start of the implementation phase. By accomplishing this, the EMR system is designed to fit the needs of the institution and stakeholders it is supposed to benefit. Modularity however still remains important to facilitate possible future integration of the EMR system into a larger network.

By human nature change implies re-evaluating one's own concept or sense making of what constitutes the best way to achieve a set goal or task (Riesenmy, 2010:164). Riesenmy (2010:169) relates sense making for physicians, to the emotional arousal and outside influences that will ultimately help them either accept or reject any EMR systems. Furthermore, physicians have also been slow to adopt EMR technology due to the believe that the new technology will have a negative effect on their medical practice with aspects of cost, support and ability to use the new systems being cited as reasons (Riesenmy, 2010:164). Riesenmy (2010:164) continued by stating that physicians would be less likely to assimilate EMR systems when there was a difference between what they expected from the implementation and to what eventually transpired due to the implementation and the resulting level of difficulty involved.

Management theory and practice, as a science, has over the past two decades been dominated by studies related to organisational change (Thurlow & Mills, 2009:459) with proper management of change seen as crucial and inevitable to the survival of any organisation. The underlying assumption and message of a plethora of works, indicating change "should, can and must" be managed (Sturdy & Grey, 2003:653). Leaders that anticipate the change and react rapidly and responsibly tend to be very successful with organizational leaders that not only anticipate but rather invent the future, becoming the leaders of their selected industry and thus the most successful by setting the pace for followers. Organisations that negate their responsibility to adapt to change tend not to survive (Pryor et al., 2008:1).

Change can be either revolutionary or evolutionary. Evolutionary changes tend to be reactive in nature as a result of external factors acting on the organisation Change in a reactive organisation tends to take on the form of sporadic or continuous improvement initiatives (Pryor et al., 2008:2). Revolutionary changes on the other hand is a radical movement that transforms the organisations to such an extent that change becomes an on-going process (Pryor et al., 2008:3). Revolutionary change in organisations makes the organisation the driving force of change in there macro-environment

Pryor et al. (2008:16) discuss various change management models with the belief that most of the models are still relevant in today's era with the exception of the speed at which the models need to be implemented. Notwithstanding the tempo of changes, organizations in the current era also has to deal with unprecedented levels of change in terms of type, quantity, complexion and immediate communication of the change throughout the world and thus requires immediate and accurate responses to changes (Pryor et al., 2008:3).

Pryor et al (2008:11) highlights, what they believe to be the core concepts of change management as found by a literature study of different change management models:

- A need for the change must be established. If there is no need to change, your personnel will not want to change.
- Change requires strong organisational leadership that will be able to drive the need for change.
- A new vision or business result must be developed and a movement created in the direction of this new vision or business result. Again strong leadership is required that will live the new vision or business result to create a strong sense of trust among the personnel by leading by example.
- Empower your personnel by providing them with the necessary tools to facilitate the change and also creating a safe environment where personnel will be safe in the knowledge that they are valued and needed. Leadership should constantly monitor and evaluate current systems, processes and capabilities to facilitate change and a healthy work environment.
- Change should be reinforced and constantly evolve to fit the needs of the organisation. Leadership should constantly look for small improvements to encourage additional change.
- Support the change throughout the change process. People respond differently to change and while some will openly embrace the change many others will strongly resist the change, especially during the development phases of the change. Leadership should understand the resistance to change and support personnel by implementing the necessary strategies to allow personnel to work through their resistance and ultimately support the change.

- Personnel should be included in the change process as facilitators and not limited to merely implementers of the change. Planning in an organisation should be extended to be both vertically and horizontally inclusive to ensure as many stakeholders as possible can be included in the change process. “When a plan is viewed as everyone’s plan, it can be embraced by everyone” (Pryor et al., 2008:12).
- Strong communication throughout the organization is required to gain support for the change.
- Change should constantly be measured and monitored and accountability established.
- Strong leadership, even if included in many of the points, warrant to be addressed separately. Transformational leader should have the ability to assess their environment, know the vision of the company and effectively convey and find support for the vision and ultimately execute the vision with a proper plan in place.

METHOD

Two South African medical institutions were approached with one in the process of implementing a new EMR system and the other at the initial stages of the deployment at the time of the study. Each had its own unique characteristics and approach in realising the EMR system.

Using Pryor et al (2008:2), the changeover to an EMR system is driven by government (macro-environment) requiring quality healthcare to be available to all through the NHI strategy (Department of Health, 2011b:44) and thus EMR systems in state funded institutions in South Africa tend to be more evolutionary than revolutionary with the need for change driven by their macro-environment.

A need for change has thus been created by the macro-environment through a mandate by government to ensure proper healthcare be available to all (Department of Health, 2011b:44). Thus the first principle of change management has been established.

The challenge of the study was found to be connecting the rest of the principles of change management as found by Pryor et al (2008:7) to challenges faced by EMR systems.

The study focused on the human aspects of the changeover to an EMR system to improve efficiency and the role change management played in the acceptance of said system. As the study related to human aspects, it was decided the study would be better suited if the research took on the form of a qualitative study by means of a narrative inquiry. As such the research methodology was essentially analytically descriptive and not statistical in nature.

According to Clandinin and Huber (2010:3) a narrative inquiry is a way of understanding and inquiring about the experience of the participants through a process of collaboration between the researcher and the participants of the study.

Narrative inquiries have three dimensions in common, namely the temporality of the information, the sociality of the study and the place where the interview is set (Clandinin & Huber, 2010:3). Careful consideration must be given to the three dimensions as together they allow the researcher to study the relational composition of the participant’s experience.

Even if Narrative inquiries do comply with the legal and procedural aspects of ethics as held by institutional research boards, careful consideration should be given to the ethical nature of the relational aspects of a narrative inquiry (Clandinin & Huber, 2010:15).

Clandinin and Huber (2010:15) define ethical consideration in narrative inquires as the negotiated responsibility between participants and researchers with the research keeping a level non-judgemental tone during the inquiry. The responsibility is also understood to be long term as the lives of both the participants and the researcher keeps unfolding and evolving while the text of the study is written and thus must respectfully relate the lives lived and stories told as a living story that represent who the participants are and continually evolve into.

As the study relate people's lives that are still in the process of unfolding, issues of anonymity and confidentiality may take on added responsibility as the study can reflect the most inner personal thoughts of the participants (Clandinin & Huber, 2010:15). As such fictionalising or blurring of identities may often occur as part of an increased attentiveness of ethical matters (Clandinin & Huber, 2010:15). As alluded to the importance of ethics and the need of keeping respondent's names confidential was taken into consideration and used.

Research objectives

Various studies have recognised the positive influence EMR systems should have on the perceived efficiencies of health professionals and also the positive influence change management as a science can have on the change process any company has to or need to make.

The rationale behind the study is to elucidate the challenges faced by health professionals in accepting new EMR systems and test if change management as a scientific field of study can be used to facilitate the changeover from a paper based system to an EMR system.

Defining the Scope of study

The primary objective of the research study was to gain insight into the challenges that health professionals face in accepting EMR systems and determining how these may best be addressed. As such the scope of the study was limited to:

- the human aspects of change management,
- perceived efficiency of health professionals, as determined by their buy-in and acceptance of the system, and
- exclude the physical implementation of the system to the extent of only incorporating the ultimate use and acceptance of the system by the health professionals they are intended to assist.

The challenges faced by EMR systems are indeed vast. There do however seem to be a common theme in most of the challenges that ultimately converge on how users experience the system and thus their resistance to the new system. At the core, the literature study two technical aspects has been identified that can be directly related to the level of acceptance of the system.

- Integration of the system and amount of input required by the health professional to capture the required data. This relates directly to additional workflow required by health professionals to perform their daily tasks.
- Usability of the system and if the information captured can be effectively used by health professionals at a later date. This relates to how health professionals perceive the system as either useful or just another wasteful task that has to be performed.

Independent from the technical difficulties faced by EMR systems, three social aspects have been recognised as critical and how health professionals perceive the system.

- Resistance to EMR systems due to health professionals lacking knowledge, skill or experience in relation to EMR systems and computers in general. This can be especially daunting aspect in developing countries where technology have limited penetration into the markets.
- Resistance to the EMR system due to a lack of proper consultation and integration. In the end it does not matter how good a system is designed or how useful the system can be. If health professional does not feel part of the change or lack adequate support in implementing the change, they will resist the change.
- Resistance to EMR systems due to a lack of communication. EMR systems, whether founded or not, sometimes do have a negative image with health professionals. Proper consultation and inclusion through open communication can address many of the concerns and in some instances help improve the system.

The scope of the study has thus been limited to five known challenges faced by health professionals and a core set of change management principles as highlighted by Pryor et al (2008:11).

RESEARCH METHODOLOGY

Although early days, the first institution, Institution A, implemented an EMR system that shows much potential, especially given the relatively short time the system was active at the time of the interview. The EMR system is also the second implementation of its kind with the first, implementation, fulfilling the role of the pilot project at another institution.

The second institution identified, Institution B was still in the process of implementing the new EMR system. As the current stage of the implementation when the research was conducted, was limited to only registering patients on the system, the personnel of the clinic had very little exposure to the system. As such the data analysis was primarily limited to Institute A with Institution B used to highlight some of the challenges faced by public health care institutions.

From the data gathered a profile has been built of both the paper based and EMR system of Institution A. The main similarities and differences are indicated below.

- Visiting patient reports to reception. If it is the patient's first visit, a new patient record is created and assigned a unique number used for filing and database management purposes. The patient is handed a patient folder that will be used to record the patient history. After the visit the patient hands the record back to reception.
    - Paper system: The patient record is filed according to the patient's unique number. The record is only sorted partially in blocks using the first couple of digits of the patient number.

  - EMR System: The patient record is scanned, automatically sorted and added to the EMR system by means of an added document barcode and also patient barcode that was added to the document. The hardcopy of the document is then handled the same as the paper record.

- Existing patient's reports to reception. Database lookup determine patient's unique number.
  - Paper system: A "document runner" is sent to find the patient file with the patient waiting until the document runner returns with the patient file which can take a substantial amount of time. After the visit the patient hands the record back to reception with the record again only partially filed and sorted according to the patient's unique number.
  - EMR system: The patient is handed an empty episode folder with only basic patient information that can be used to retrieve the complete patient history from the EMR system. After the visit, new paper records added to the episode folder is handed back to reception. The episode folder is scanned, automatically sorted and added to the EMR system as previously. The episode folder is then added to the existing hard copy of the patient record.

Given the sheer number of patients that visit the hospital, it is not a far stretch of the imagination the amount of time that may be needed to retrieve a patient's record in the paper based system and also the fact that patients carry their own files, a fare possibility exists of pages or even whole records being lost.

After various consultations with different stakeholder and building on experience, it was decided for the interim to limit the EMR system to electronically capturing new paper based records by means of a document scanner with pages of the patient file saved as Portable Document Format (PDF) files. Current standards already exist for the different types of paper based documents and by making minor adjustments to the format of these documents and also adding a unique barcode to each document, allows the documents to be scanned easily and then automatically sorted according to the added barcode. As each patient is already assigned a numeric number used by the paper based record system, a simple process of adding a printed barcode with the patient's unique number to each page allows the documents to be automatically assigned to the correct patient in the EMR record system with a human operator only needing to check every document scanned to ensure the barcodes of each document was captured and decoded correctly.

Given the amount of existing patients, the cost of scanning old files will be exorbitant which resulted in the decision being made to scan existing records on demand when a patient not already registered on the system visits or makes an appointment to visit the hospital.

FINDINGS

After careful analysis of the data and comparing it to the literature survey, some common denominators was found between the challenges faced by previously implemented EMR systems and also known principles of change management. The results are tabulated in

Table **Error! No text of specified style in document.**-1 and

Table **Error! No text of specified style in document.**-2.

*Table **Error! No text of specified style in document.**-1: Common denominators found between known principles of change management and data gathered for Institution A.*

Known change management principle from literature review	Change management principle found in data gathered
A need for the change must be established. If there is no need to change, your personnel will not want to change.	The need for the change in this instance is a need to improve on the services provided to patients that is dependent on public health care and not such a clear advantage to the hospital staff themselves. As Respondent A (2013) indicated they needed to find the right "hook" for every hospital department to instil the need or even just acceptance of the change. In this regard it does seem as if the need for change has been found to be important and also actively used to convince the hospital staff to use the new EMR system.
Change requires strong organisational leadership that will be able to drive the need for change.	This principle was found to be very important for the new EMR implementation at Institution A with much time and effort invested by the vendor to ensure the leadership accepted and wanted the change and also actively participated in driving the need for change.
Empower your personnel by providing them with the necessary tools to facilitate the change and also creating a safe environment where personnel will be safe in the knowledge that they are valued and needed.	The use of this principle while not clear cut does seem to have been used at Institution A with much consideration taken in the way the EMR system was implemented and also the way the training and initial support has been approached. This helped to ensure hospital staff had the necessary support in the use of the system.
Support the change throughout the change process.	The vendors of the EMR system understood the concept of needing to support the change process and invested many hours to support and overcome any resistance to the new EMR system.
Personnel should be included in the change process as facilitators and not limited to implementers of change only.	As Respondent A (2013) indicated, a top down, bottom up approach was taken to ensure as many of the stakeholders was part of the development of the EMR system with lots of man hours invested into top management as well as the different departments in the hospital.
Strong communication throughout the organization is required to gain support for the change.	Respondent A (2013) as previously mentioned found the implementation of the EMR system to be a very hands on approach with much time and effort invested to ensure the different departments within the hospital was aware of all the changes that's going to take place.
Change should constantly be measured and monitored and accountability established.	Although a very important principle, Respondent A (2013) did find this to be a bit of a grey area with many different stakeholders expecting different results from the EMR system implemented. Contractual deliverables also focused on the implementation of the system rather than the outcomes of the system. From the respondents (Respondent A, 2013) perspective, while not explicitly indicated as a deliverable, found reduction of patient

Known change management principle from literature review	Change management principle found in data gathered
	waiting times at the hospital of the pilot EMR implementation to be one of the biggest advantages of the EMR system when viewed from the ground level with patients having to wait shorter times are more happy patients which in turn improves the working conditions of hospital personnel as they have to deal with less disgruntled patients.

*Table **Error! No text of specified style in document.**-2: Common denominators found between existing EMR systems and data gathered.*

Challenges identified from literature review	Challenges identified from data gathered.
Resistance to EMR systems due to health professionals lacking knowledge, skill or experience in relation to EMR systems and computers in general.	The challenge relating to Information and Communication Technology (ICT) skills did show commonalities with many of the hospital and clinic staff having very little exposure to technology and computers. A very interesting aspect found during the research was that using a computer is not the same as being computer literate and any analysis prior to implementation should be done carefully to distinguish between computer use and computer literacy.
Integration of the system and amount of input required by the health professional to capture the required data and then retrieve the information.	Respondent A (2013) also found a correlation between the acceptance of the EMR system by medical personnel and ease of use of the system and put it to good use when designing the new EMR system.
Resistance to the EMR system due to a lack of proper consultation.	Institution A in the opinion of this researcher fared much better in taking heed of this by consulting and keeping up to date different stakeholder on a continual bases. Many of the staff in Institution B knew but did not show any real insight into the system or could provide much detail how the system was going to be implemented.

In Institution A it was found many of the hospital staff were if not happy at least comfortable with the idea having to use the new EMR system with the bigger shock only being realised later when they would have to actually use the system. The solution to convincing the hospital personnel to use the system was in implementing a halfway solution that will not have a major impact on the way the hospital has always functioned as the technology and infrastructure will not allow the complete removal of paper. The change process to the new EMR system also showed strong indications of being properly managed with hospital staff kept up to date on a continual base.

The EMR system had specific contractual deliverables that could be used to determine the success of the system. In the end an unlikely outcome of the system was to the respondent's (Respondent A,

2013) opinion a far better indicator of the success of the system, namely patient waiting times. While not a specific outcome, it was found during the research and the implementation of the pilot EMR system, the single biggest complaint for public health care to be patient waiting times with the average waiting time for hospitals in the Eastern Cape province of South Africa found to be in the region of 3 to 4 hours just to get your patient file and then additional waiting times wherever you need to go inside the hospital.

The strength of the new EMR system is not giving the patient their file but rather an empty episode folder for that specific visit with the new records in the episode folder added to the EMR system when the folder is handed back to the hospital.

If patient waiting times is thus used as indicator of the success of the system, then reducing patient waiting times should be the aim of any new system. In that respect Respondent A (2013) believe the new EMR system to be a major success as the reception area of the hospital where the pilot EMR system was implemented, being far less congested than any institution of similar size.

A secondary advantage of the new system is a reduction of lost records as the chances of a paper based patient records being misplaced or lost very small as the patient does not carry the complete record with them anymore with a digital copy of the patient record always available in case the original is accidentally lost or misplaced. As the loss of records is reduced, a real chance of reducing legal cost exist as the hospital will no longer have to deal with lawsuits and unable to provide a complete record of the patients visit to disprove any claims made against the hospital.

Institution B while having a vastly different need from an EMR system faces an uphill battle to implementing the new EMR system given the institution is reliant on the new EMR system being funded from an external source and thus would have to accept the new EMR system as is rather than customising the EMR system to the needs of the clinic. The clinic furthermore seems to lack strong leadership due to the clinic being supported and managed by various organisations, each with its own culture and way of doing things which in turn creates uncertainty with personnel what exactly is expected from them.

The general lesson learned from Institution A:

- A proper analysis of the needs of any institution must be done to fully realise what would be expected from the new EMR system to ensure the general success of the system in public health care institutions.
- Dealing with constant changes in deadlines is a reality any system will face when generally dealing with state funded institutions and public health care in general.
- Clear communication with the different stakeholders is of utmost importance with Respondent A (2013) indicated they sat in on various meetings with different hospital departments to keep them up to date on the status of the new EMR system and also asking the opinion of personnel of the functions discussed and thus including them in the design process.
- For any project to be successful, you must have the support of senior management with senior management also needing to provide a clear vision and strong leadership.
- Respondent A (2013) also indicated they found managing the changeover process for the health profession a very “hands on” exercise requiring many hours of face to face time.

- The respondent (Respondent A, 2013) found the medical field functioned very different from other fields in the sense of being a very personal experience which also translate to the way the medical field is managed. This also required the changeover process to be managed on a very personal level needing buy in from everybody with each department being approach separately taking into consideration how the system can make a difference to their specific job.
- Responded A found it is very prudent to approach ICT support, at least in the very beginning, very proactively as it was found if the support was not immediately available hospital personnel would merely bypass the system as they did not have the time to wait for ICT support to solve their problem.
- If system integration is a requirement of the EMR system, Respondent A (2013) believes a mandate to integrate should be instilled in both parties that need to integrate for any system integration to be truly successful.
- True increase in efficiency can only be achieved by system integration and it is the believe of the respondent (Respondent A, 2013) the EMR system could in future have a dramatic effect on efficiency if the EMR or more broadly the Electronic Content Management (ECM) system, acts as a centralised hub that hospital staff can use to look up all the data of patients records from a centralised point instead of needing to log into various systems to be able to view all the patient records.
- Any EMR system should be kept as simple as possible to assist personnel with limited ICT skills in operating the system. Sometimes the use must be limited to only what was absolutely needed rather than to what is possible if the latest technology is used.
- The respondent (Respondent A, 2013) also found that Institution A as a tertiary training hospital did shows signs of having a split personality when it came to ICT skills. On the one hand the relatively young doctors that grew up with technology showed a real eagerness for new technology while much resistance and hostility towards technology was found from the administrative clerks and hospital nurses.
- Even if using a computer routinely during a normal working day, it still does not constitute being computer literate at all. The administrative staff from the respondents (Respondent A, 2013) experience showed a unique characteristic as many of them used computers routinely during their normal working day while not being computer literate at all and learned there job by rote by observing another person completing the computer related task and then memorising the steps needed to complete the task without any real understanding of the process involved in what they have done. As an example to explain this statement, the respondent (Respondent A, 2013) indicated when observing administrative personnel completing computer task, many were unable to complete the task if the computer was not already setup and ready at the correct start position or if they accidentally accessed the wrong menu function could not correct the mistake. Having a false sense of the real computer literacy can prove to be a real challenge to the new EMR system which could result in personnel using the system becoming negative about the system while incurring additional costs and unforeseen delays to revise and rectify the previous incorrect assumption.

- The true success of any EMR system if viewed from a patient centric view needs to directly improve the experience patients have of public health care.

The general lesson learned from Institution B:

- Personnel if exposed to a previously failed EMR system would be exceptionally biased negatively to any new EMR system.
- Health care institutions supported by various non-profit organisation and institutions tend to lack clear leadership with a clear vision and goal to drive the change process for the new EMR system.
- If the health care institution is dependent on mostly student or volunteer support, can cause the institution to have a relatively high turnover rate of personnel which complicates staff training as a large number of staff required training on a continual bases.
- Even if any EMR system will be very useful to senior management and the government in directing state resources where needed, it should always be realised if people on ground level does not see the advantage of the EMR system and use the system, there will be no data available for senior managers and government to analyse. The change process should thus be a top down bottom up approach to ensure buy in from all hospital staff and finding the key "hook" for every stakeholder of utmost importance.

CONCLUSIONS AND RECOMMENDATIONS

In general the two institutes studied have been found to have vastly different operating conditions and needs that would have to be addressed by any new EMR system. Both in general do have to overcome very similar challenges of limited ICT skills with many of the staff needing to be convinced the new EMR system will have a positive influence to the benefit of the patients, staff and institution.

A very interesting detail found was the difference between computer use and being computer literate. The administrative staff from the respondents (Respondent A, 2013) experience showed a unique characteristic as many of them used computers routinely during their normal working day while not being computer literate at all. The respondent (Respondent A, 2013) found that many of the administrative staff learned there job by rote by observing another person completing the computer related task and then memorising the steps needed to complete the task without any real understanding of the process involved in what they have done. As an example to explain this statement, the respondent (Respondent A, 2013) indicated when observing administrative personnel completing computer task, many were unable to complete the task if the computer was not already setup and ready at the correct start position or if they accidentally accessed the wrong menu function, they could not correct the mistake and complete the memorised steps of the task.

Having a false sense of the real computer literacy can prove to be a real challenge to the new EMR system which could result in personnel using the system becoming negative about the system while incurring additional costs and unforeseen delays to revise and rectify the previous incorrect assumption.

The new EMR implementation for Institution A is a very innovative solution taking into consideration many of the challenges faced by EMR systems. What in the view of the researcher does really distinguish the EMR system from other solutions is the way the change process was implemented.

The vendor did a careful analysis of the challenges faced, customised the solution to fit the needs of the hospital and in general the prevalent conditions in South African hospitals. The vendor also showed insights in the working of the health sector and used this to the advantage of the change process.

Given the literature survey and the research undertaken, there do seem to be a real world need to properly manage the changeover process to any new EMR system as the use of technology is not only seen as a way of effectively using limited resources (Chan & Kaufman, 2010:301) but also mandated by the South African government as part of the NHI strategy (Department of Health, 2011b:44).

Translating the findings of this study to the research objectives, it was found that establishing what constitutes efficiency to be a far more complex question than originally anticipated as different stakeholders will relate very differently as to how efficiency should be measured with most relating efficiency in terms of what is important to them. In this regard, some of the administration personnel at Institution A will claim no efficiency has been achieved as their work load rather increased than decreased. Doctors and other health professionals inside the hospital may claim either a slight improvement or no change at all as their daily task has to a large extent not changed at all. The true winners in terms of efficiencies gained as indicated by Respondent A (2013) would be the patients visiting the hospital as patient waiting times has been reduced dramatically at the hospital of the pilot EMR system when compared to similar institutions.

Originally the study intended to determine the success of the EMR system based on the perceived efficiency of health professionals as related to their buy-in and acceptance of the system. As different stakeholders expect different results from the EMR system, limiting efficiency to health professionals may not truly reflect the ultimate goal of EMR systems in improving health care. On conclusion of the study, it was found that the ultimate function of public health care which is serving the medical needs of the public may be a better indication of the success of the system. The Human factor should however never be ignored as the system will not be able to function properly if not if not accepted by all the stakeholders of the system. If patient waiting times is thus used as a measure of efficiency, it is the opinion of the researcher that a correlation exists between the EMR implementation at Institution A and the efficiency achieved. As institution B is still in the early stages of the changeover process, it is difficult to relate if any efficiency has been achieved as the EMR system was at the time of the study still limited to registering new patients on the system and has not reached the core function of the clinic namely providing health services to the public.

Institution A does show strong signs that change management as a science has been used during the changeover process and in the belief of the researcher did have a real world impact on the effectiveness of the EMR system. It was found that Institution B has not taken such direct cognizance of change management as a science. As the EMR implementation is still in the early stages of the implementation process, it is difficult to determine if and what impact it may have on the EMR system once the system have been fully deployed.

The limitations set to the scope of the study has been found to be relevant with the possible exception of rather needing to define efficiency in term of the patients visiting the institution as any efficiencies gained or lost at the different points of the health care chain, will ultimately translate to the how patients perceive and experience the health care system. Moreover if efficiency has to be

limited to a single criteria, Respondent A found patient waiting times to be one of most complained about problems in South African public health care and thus may be used as a more effective measure of efficiency to determine if a EMR system constitute improved efficiency.

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Prospective authors are invited to submit academic papers reporting original unpublished research and recent developments in the topics related to the conference.

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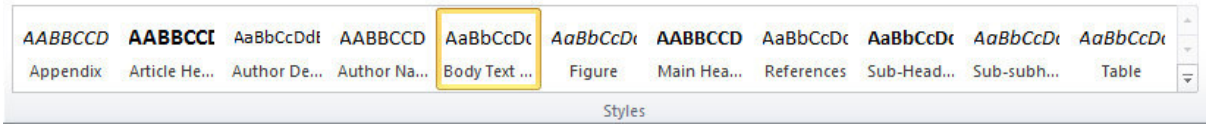

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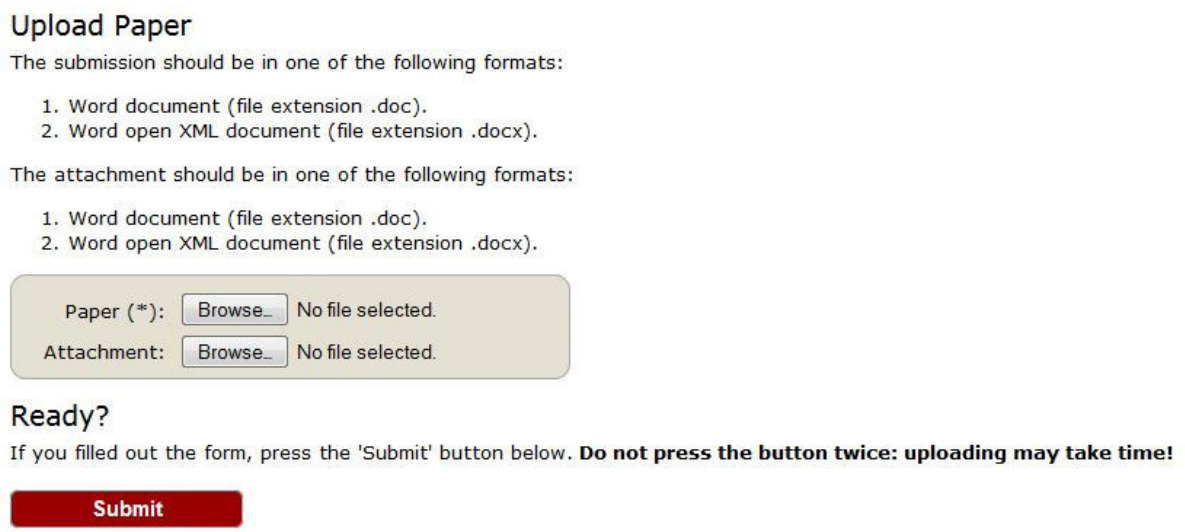

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