

# The Implementation of Electronic Health Record Systems: The factors influencing the successful implementation of Electronic Health Record Systems.

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**Abstract—** The Electronic Health Record is a very important technology to improve the health care delivery, but the implementation has been challenging. However despite of all the benefits, physicians are not showing interest in adopting the technology and to compete well in today's market all health institutions must explore the opportunities of the new technology.

The aim of this paper is to critically analyze the factors which influence the successful implementation of the EHR system. To achieve the successful implementation of EHR there is need for involvement and participation of all the relevant stakeholder groups in the health sector. Involvement and the dedicated attitude of users is very important to achieve implementation success. A good leadership skill and change management strategy is also very important to manage people. The end users should be communicated too as early as possible to involve them in implementation.

Assessing the workflow and ensuring a continuous workflow in the organization is very important. Interoperability is one of the major barriers that must be addressed in implementing an EHR. Staff training on their new job role will facilitate implementation and improve work efficiency and this will help to minimize time spent. Finally, evaluating the organizational needs is also very important in implementation.

**Index Terms—** Ambulatory care, adoption, interoperability , patient's referral , system monitoring , workflow, workers resistance.

## 1. INTRODUCTION

The implementation of Electronic Medical Record is very important to improve health care delivery and increases patients' safety (Hillestad ,2005). It is also important to meet the challenges of documenting, communicating and evaluating effectively in the health system, therefore information and communication system should be implemented (Blobel, 2004).

The Institute of Medicine said Electronic Health Records (EHRs) must be implemented widely to achieve a better health delivery service and to provide a better safety for patients (Institute of

Medicine, 2001; Institute of Medicine, 2006 and Bates et al, 2003) and the adoption of EHRs will improve ambulatory care in term of cost (Hillestad ,2005 and Miller et al, 2005). Adopting the EHR will aid advanced examination potential and provide better assessment and improved quality care (Jensen et al, 2009). Also the National Alliance for Primary Care Informatics said by the time Electronic health record is widely adopted, it will provide better health care safety and will aid research (Bates et al, 2003). However despite of all the benefits, physicians are not showing interest in adopting the technology (Massaro, 1993 and Loomis et al, 2002) and to compete well in today's

market all organizations must explore the opportunities of new technologies (Lauer et al, 2000).

Any Information and Communication Technology ICT used in the health care system is assumed to be contributing to the increase in quality of health care, therefore the implementation should be subject to incessant quality improvement (Talmon, 2006).

The potentials of Health Information Technology has been said to be numerous in health delivery and in improving health care (Blumenthal and Glaser, 2007). Surprisingly, MGH Institute for Health Policy (2006), said the adoption of EHR is going at a very slow rate less than what was expected (Cited by Houser and Johnson). Therefore, to explore these opportunities, there are challenges to be faced in implementing and utilizing the technology (Lauer et al, 2000).

Although these benefits are great but they have not superseded the barriers (Giannini and Johnson, 2008).

Although, the major challenges affecting implementation are human factor, organizational and leadership problems (Wyatt, 1995; Dick et al, 1997 and Lorenzi and Riley, 2000). Also a large sum of money will be required to implement an electronic health record (Schmitt and Wofford & Kuperman and Gibson, 2003) which also requires good managerial skill for the implementation to be successful and to ensure its efficient use by health professionals (Poissant, 2005).

## 2. STAKEHOLDERS

Terry et al (2008) said for the successful implementation of EHR there is need for involvement and commitment of all the relevant stakeholder groups in health. According to Van DerMeijden et al (2003), he said a system has failed if it is completely rejected by the users, although the success of a system cannot actually be defined. He said success can be determined by evaluating the settings where it will be used, the purpose of the system and the stakeholders involved in the use.

Lorenzi et al (1995) said

*“the technically best system may be woefully inadequate if its implementation is resisted by people who have low psychological ownership in that system. On the other hand people with high ownership can make a technically mediocre system function fairly well “*

A reasonable approach to designing a new system is to involve the end users of the system (Robey, 1979) because to achieve success in implementation, human being consideration is very important (Ang et al, 1995; Johnson and Davis, 2004; Fenton et al, 2006 and Adler, 2007). Involvement and dedicated attitudes of stakeholders in the health sector are very important in the implementation of electronic health record (Mount et al, 2000). Singleton et al (2007) in his work listed the five stakeholders to be involved in the implementation of EHR as patients, the general public, all professional involved, managers or administrators and the application vendors.

An important success factor is involving people and patients connected to the practice as part of the implementation team and this will ensure that their information needs are taking into consideration (Mount et al, 2000).

EHR must be accepted among doctors, nurses and other health professionals for it to be successfully implemented (Mohd and Mohamad, 2005). Houser and Johnson (2008) said ignorance about EHR and non-cooperation of clinical staff have contributed to the implementation failure of EHR. Moreover, implementation is said to be a failure if employees do not show care about it or they fail to use it to full capacity in order to achieve its full potential (Klein and Sorra, 1996), attitudes of users about the system determines their use (Robey, 1979) and for a technology to be fully accepted it depends on the adjustment of the users to the new environment (Doebbeling et al, 2006).

The managers' attitudes and the users' view about a technology affect their readiness to use it and it will affect the implementation (Leonard-Bartonan and Deschamps, 1988 cited by Edmondson et al, 2001) because successful implementation entails the frequent use of the technology on a daily basis in the establishment (Szulanski, 2000 cited by Edmondson et al, 2001). Therefore, it is very

important to involve staff early enough so as to commit them into the implementation process (Lorenzi et al, 2009).

It is also important to invite the vendor into the implementation plan (Swanson et al., 1997), for him to understand the existing workflow and organizational needs before implementation (Chin and Krall, 1997; Keshavjee et al, 2006). As a start vendors should be required to build data model using the standard clinical data format (Bates, 2005). However, the technology to be adopted should be simple to install and managed locally and easily adapted to suit the purpose of other health Institutions (Lorenzi et al, 2009).

### **3. LEADERSHIP AND CHANGE MANAGEMENT**

Leadership and change management are the important issues to consider in implementation of any information technology (Lorenzi and Riley, 2004), this is so because the effect of technology is not much in the implementation process (Berg, 2001). Successful implementation requires good communication skill and staff cooperation (Northwest Health Foundation, 2008).

A champion is needed for EHR to be successfully implemented and the champion must be skillful and well respected by his colleagues because he will give support when everybody is getting frustrated (Miller, 2003; Scott et al., 2005; Keshavjee et al., 2006; Adler, 2007; Terry et al, 2008; Northwest Health Foundation, 2008; Ludwick, 2009; Lorenzi et al, 2009). Though, the champion could be a physician, nurse or any of the team members (Terry et al, 2008). Without the champion there will be a great challenge in actualizing the implementation dream (Northwest Health Foundation, 2008).

The use of new technology varies between individuals but for implementation, the use is accessed at the organizational level (Klein and Sorra, 1996). Moreover, the need for an efficient management team is an important factor in ensuring EHR implementation (Ang et al, 1995; Wager et al, 2000, Sanchez et al, 2005, Scott et al, 2005; and Adler, 2007). However, EHR implementation in large practices suffers from

team issue while in small practices suffers from inadequate resources (Adler, 2007). Adler (2007), said human factors especially leadership problem are the main issues to EHR implementation, therefore the management commitment is essential for the success of implementation (Aladwani, 2001).

Lorenzy and Riley (2000) concluded in his opinion that in the success of implementing a project, that the attitude and skill of the developer is 80% and the installing of the technology is 20%.

Change is usually initiated by staffs that work together in ambulatory settings (Lorenzi et al, 2009), and to achieve change it is crucial for the staff to know it is achievable (Lorenzi et al, 2009). Also, a cooperative culture may encourage taking decision together and will make it easy to identify group needs and views (Doebbeling et al, 2006), which are very important and should be taking into consideration by the management (Singarella, 1995; Mazzoleni et al, 1996 and Sanchez et al, 2005). Moreover, all staff should be involved in making the change possible (Lorenzi et al, 2009) and using multidisciplinary approach is important to fully enjoy the implementation of EHR (Doebbeling et al, 2006; ; Ludwick, 2009 ).

It is essential that all staff involved in the use of the new technology understand and support the objectives of the organization (Sandberg and Targama, 1998 Cited by Nikula, 1999. Eby et al (2000), said staff view about organization readiness to accommodate change influences their cooperation. However, Aladwani (2001) identified workers resistance as one of the challenges faced by system implementation, and that resistance among staff is usually due to learning new skills and leaving old ones (Northwest Health Foundation, 2008), though the resistance is always temporary among smaller health organizations (Wiener and Fagerhaugh, 1985). However Equity Implementation models assumes that there is no basics for resistance to change, that change can be considered favourable or unfavourable by different individuals (Joshi, 1991; Lauer et al, 2000). Also, Lorenzi and Riley (2000) said resistance to change remains a problem at both individual and organization level and it also limit the level of system performance.

Dedicated leadership, effective communication, balanced and empowered team are important in making change (Sarker and Lee, 2003). Lorenzi et al, (2004) said change management in the health sector is a process by which the sector strengthen and orientates its employees "from an old way of doing things to a new way of doing it". Therefore, it is always good to measure and communicate implementation stages and progress to staff (Adder, 2007). The attitude of potential users must be changed and this can be done using communication as a strategy to educate them about the benefits of introducing the new system (Aladwani, 2001). Also to change users' attitude effective communication can also be used to tell them about how the implementation will enhance their work because workers are not likely to accept what they do not understand how it works (Aladwani, 2001).

Members of staff should be effectively communicated too and they must be involved as part of the successful implementation of the project to enumerate strengths and weaknesses and also, involving them early will encourage their full participation (Amoako-Gyampah and Salam, 2003; Studer, 2005). Edmondson et al (2001), said how a technology is presented to the organization determines how they view it, whether it is interesting or threatening to learn. He also emphasizes the role of a team manager in introducing change and that the leader should introduce face to face method and teamwork when faced with challenges of a routine work in implementing a new technology.

#### 4. FINANCIAL MANAGEMENT

Inadequate finances and other limited resources are contributing to delay in implementation of EHR (Houser and Johnson, 2008). The cost of implementation is the most common cited challenge of adopting EHR (Giannini and Johnson, 2008) because implementing EHR requires a huge investment ranging to millions of dollars (Schmitt and Wofford, 2002 cited in Poissant, 2005).

There is a great concern from physicians about the financial strength needed to initiate the adoption of EHR (Houser and Johnson, 2008 & Ludwick, 2009). These costs include the money for training,

acquiring and setting up the technology (Miller and Sim, 2004; ; Ludwick, 2009). Also some unforeseen running cost may arise immediately after implementation due to the decline in care efficiency (Baron et al, 2005).

However physicians are not interested in adopting it because they believed it slows down work, and they earn more money with increased in number of patients they see (Ludwick and Doucette, 2009). Also implementing EHR may not yield a financial return until the third year, and the implementation process requires serious hard work (Adder, 2007), although a study by Grieger et al (2007) said an ambulatory offices can bring a quick profit on investment if affiliated to a university medical centre.

Baron et al, (2005) expressed the need for small practices to be supported financially for them to successfully implement an EHR. He said it is inexperience to conclude that small hospitals will widely adopt EHR without getting financial support for reimbursement models. He also advised on the importance of visiting practices that have adopted the desired system to inquire about the unforeseen costs and the potential vendor problems and to seek solutions to these problems.

#### 5. WORKFLOW ANALYSIS

A survey by American Academy of Family Physicians (AAFP) (2003) noted that out of the 5000 respondents, 54.2 % showed concern that implementing EHR will slow down their work flow and reduce their productivity (cited by Lorenzi et al, 2009). Therefore in implementing a new technology, caution should be taken to avoid increasing clinicians work burden because when providers see EHR has burden their efficiency will be reduced (Doebbeling et al, 2006). Waegemann (2003), said health professionals see computing as an additional work, they prefer more writing than computer imputing. Work flow should be guided by office simplicity, easy access for patient, safety, elaborate documentation and delegating duties (Baron et al, 2005).

Workflow redesigning should be considered as an important issue in EHR implementation (Adder,

2007) because analyzing workflow can force some obvious changes on an organization (Nohr, et al, 2005). However, the medical record institute survey (2004) showed that most practices adopted EHR for it to facilitate their workflow (Cited by Houck, 2006). However, another publication by Advancing Health Information Technology (2004) argued that since health information technology can alter hospital workflow, that it should change it to attain the best level of productivity and job efficiency. Also Adder (2007) said the present office process should be examined and see how it can fit to the implementation workflow design.

Poissant (2005), said integrating EHR into hospital workflow should be given consideration in the implementation planning in other to optimize its use in the clinic. Work flow should be adapted to meet the needs of the organisation (Nanji et al, 2009), EHR that does not fit into the hospital workflow will cause a diminish in financial return (Veterans Health Information Systems and Technology Architecture cited by Lorenzi et al, 2009). However Baron et al (2005) express concern about implementing EHR and maintaining the practice work flow that have existed for more than 15 years in a short time. Although, he said it is good to review and redesign workflow during EHR implementation.

EHR will alter job roles and change activities in the system though it gives opportunity to improve service performance (Adder, 2007). However a system that limits job performance or reduces benefit is not likely to be happily accepted, even after cautious implementation effort (Robey, 1979).

## 6. INTEROPERABILITY

US Department of Health and Human Services (2005) describes interoperability as the transfer of patients' medical information among health professionals under strict security and as when due.

Interoperability is one of the major barriers that must be addressed in implementing an EHR (Blobel et al, 2003; Blobel, 2004; Baron et al, 2005; Peter et al, 2005; US Department of Health and Human Services, 2005 and Jasper et al, 2006) and it

is also seen by Giannini & Johnson (2008) as the greatest benefit of implementation. The aim of Continuity Care Record designed by Massachusetts Medical Society and other bodies is to ensure continuity in care, minimize minimal errors and to guaranty to the minimum possible the exchange of patients' data from one provider to the other in a case of patient's referral (Peter et al, 2005). However, Waegemann (2003) said there is lack of standard frame work and motivation to allow interoperability, which should be one of the benefits of EHR.

Most EHR have the problem of interoperating with other applications and the fact remains that most physicians will like to have easy flow of information between them and the laboratory, radiology and to send and request medication lists (Bates, 2005). American Health Information Management Association and American Medical Informatics Association Terminology and Classification Policy Task Force, said terminology is necessary to ensure a successful interoperability and in deploying a national health information network (Cited by Giannangelo and Fenton, 2008).

Security is a crucial factor for the successful implementation and social adoption of the EHR (Katehakis et al, 2007; Breu et al, 2008). There is also fear about privacy and patient safety (Ludwick, 2009). Interoperable systems' design must be incorporated into a secured EHR for the system to be simple, relevant, flexible and scalable (Blobel, 2000).

## 7. TRAINING

A study conducted at Alabama hospitals by Houser and Johnson (2008) showed that implementation has been impaired because staff do not have knowledge about EHR and there are no provision yet to train them. Adequate training is a crucial part of EHR implementation (Studer, 2005; Terry et al, 2008) and different training should be given to different job roles (Terry et al, 2008).

Sufficient training and incessant development of staff is very important to facilitate successful implementation of EHR in the health sector (Fleischer, Liker, & Arnsdorf, 1988 cited by Klein and Sorra, 1996; Amoako-Gyampah and

Salam,2003 ; Baronet al, 2005; Fenton et al, 2006; ; Ludwick, 2009; Nanji et al, 2009). Training should commence as soon as the implementation plan is initiated (Fenton et al, 2006).

Level of computer literacy also influence implementation (Stewart, 2006; Terry et al, 2008) and initial training may vary with software and implementation plan (Adder, 2007). However, some complex skill may require more than one training section (Adder, 2007). Baron et al (2005) said training requirement varies from one team members to another. He said two types of trainings should be given: Some people will be trained as super user for them to be able to set up, maintain the system and perform other administrative works on the system while some are trained as regular (basic) users but will not be able to make alteration to the system or do any administrative work on it. Vendors can help design templates to suit the training style (Adder, 2007).

Adder, (2007) said a busy day is not the best day to commence using the EHR, he said it is better done on a less busy day. Training helps users to adjust to the new system and it brings a positive attitude towards the system (Aladwani, 2001).

## 8. TIME ISSUES

One of the intended aims of EHR is to manage time but time inefficiency has been a major challenge to its successful implementation (POISSANT, 2005). Implementing EHR requires a lot of time in taking decisions, training staff and in system monitoring (Lorenzi et al, 2009). Time becomes an issue when switching from paper to electronic records, because there will be need to adapt to this new method and the change in workflow (Stewart, 2006).

It will take time to implement EHR (Ludwick, 2009) and physicians do not have enough time for this (Stewart, 2006). Moreover, the initial state that requires transcribing data from paper records to electronic record is frustrating and consumes time (Stewart 2006). To ensure successful implementation of EHR, managers should know and understand how to manage critical factors that will improve time management of documentation (POISSANT, 2005). However, the benefit of EHR

can be enjoyed without spending too much time for clinical works (Pizziferri, 2005).

## 9. EVALUATION

There should be an expectation before implementation (Studer, 2005; Terry et al, 2008) and with this, all the needs of the health organization will be highlighted and see who will perform each of the tasks involved in the use of the system (Terry et al, 2008) . There should be an expected content of the EHR, like patient data and laboratory results before implementation and they should be incorporated into the system (Lorenzi et, al, 2009). This can be done by getting the necessary data from the existing paper recording system (Lorenzi et, al, 2009).

Implementation is the period between making decision to adopt a new technology and the time the technology is been used for the day to day running of the organization (Klein and Sorra, 1996) and there is need for goal setting before implementation as a way of measuring the success of the project (Adder, 2007).

In preparing for implementation, the effect of the change on individual should be evaluated and examined, if fair on all staff and if not measure should be made to compensate the individuals In form of remuneration for excess work or by improving the system interface to reduce the employee task (Joshi, 1991; Lauer et al, 2000).

It is important to thoroughly investigate vendors before engaging their services to avoid disappointment (Adder, 2007). Poor written software can also cause implementation failure though most failures are caused by human issues (Adder, 2007).

## 10. CONCLUSION

The implementation of Electronic Health Record is faced with many challenges that could cause its failure if not properly managed. The major factors discussed are stakeholders' influence, leadership and change management, financial management, workflow, interoperability, training, financial issues and evaluation.

Human factor has been discussed as a major issue in implementation but it requires good leadership and communication skills to manage people

involved in the implementation successfully. A champion who will act like a leader will be needed from the organization to carry everybody involved in the implementation along by encouraging them. To achieve a successful implementation, change management strategies should also be introduced. Early and effective communication of information about the project with the staff is very important because there cannot be implementation success without the system acceptance by the end users.

Another important factor militating against implementation is finances. The cost of initial implementation, maintenance and money needed for staff training is a major challenge. The interference in workflow will also affect income generation because money is made according to the number of patients seen. The disturbance in workflow especially at the beginning of implementation will reduce work efficiency. However as part of implementation it is important to access the organization workflow and to see how the change will affect it. This will help to prepare for the organization needs in advance. Interoperability is an important desire in the implementation of EHR and it should be incorporated into it. American Health Information Management Association and American Medical Informatics Association Terminology and Classification Policy Task Force, said terminology is necessary to ensure a successful interoperability and in deploying national health information network (Cited by Giannangelo and Fenton, 2008).

Training staff for their new job role is very important for successful EHR implementation because the technology cannot operate without human influence. Technology requires full use for it to attain its full potential. Organizations should plan for this because technically incompetent people cannot perform successfully in such atmosphere. The issue of time spent on operating EHR was also mentioned as a concern but with proper training the skill will be perfected over time and will improve job efficiency.

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