Barriers to the Adoption of Health Information Technology

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Abstract

Information Technology (IT) is successfully applied in a diverse range of fields. Though, the field of Medical Informatics is more than three decades old, it shows a very slow progress compared to many other fields in which the application of IT is growing rapidly. The spending on IT in health care is shooting up but the road to successful use of IT in health care has not been easy. This paper discusses about the barriers to the successful adoption of information technology in clinical environments and outlines the different approaches used by various countries and organisations to tackle the issues successfully. Investing financial and other resources to overcome the barriers for successful adoption of HIT is highly important to realise the dream of a future healthcare system with each customer having secure, private Electronic Health Record (EHR) that is available whenever and wherever needed, enabling the highest degree of coordinated medical care based on the latest medical knowledge and evidence. Arguably, the paper reviews barriers to HIT from organisations' alignment in respect to the leadership; with their stated values when accepting or willingness to consider the HIT as a determinant factor on their decision-making processes. However, the review concludes that there are many aspects of the organisational accountability and readiness to agree to the technology implementation.

Keywords: Medical Informatics, Health Informatics, Health Information Technology, Health Information Systems

1. Introduction

Medical Informatics (or Health Informatics) is the applied science which interconnects the disciplines of medicine, business, patient centered care, and information technology, in order to significantly and measurably improve both healthcare quality and cost effectiveness. Medical informatics tools, technology and tactics include not only computers and information systems, but also clinical guidelines, formal medical languages, standards, interoperability, and communication systems. (Goldstein, et al., 2007, p.8)

As with many applications of IT, if applied effectively, health information technology can dramatically improve the healthcare service experience of both clinicians and patients.

'*Informatics can help physicians better incorporate into clinical practice one of the most underused resources in medicine, the patient, whose help is greatly enhanced through this new technology*.' (Hersh, 2009) However, far too little attention has been paid to the efficient adoption of IT in health care.

Medical informatics should engage patients to be active partners in their medical care. This will help in reducing deadly medical errors and reduces unnecessary costs (Goldstein, et al., 2007, p.4). Medical practitioners and researchers can harness the power of IT to elevate the medical capabilities and knowledge to new heights. An appropriate and accurate application of IT into healthcare can create better systems to save lives, improve quality and reduce costs. According to Goldstein, et al., (2007) tangible and intangible benefits such as increased revenue, cost reductions, improved productivity, improved patient satisfaction, reduced length of stay, improved quality of care, improved medication safety, enhanced compliance efforts and Utilisation of community based, evidence based best practices can be achieved by adopting HIT in clinical environments.

Though IT has been successfully applied in many diverse fields such as education, defense, science, business, etc., it has not been productively used in healthcare to realise the true potential due to various impediments. Whilst limited body of literature suggests HIT is a positive step forward, there are many body of knowledge highlights that negative effect of the HIT in particular for healthcare arena.

'*Out-dated and non-existent health information technology systems lead to high costs, poor quality, non-patient centric care, an epidemic of medical errors, and insufficient disaster preparedness*.' (Goldstein, et al., 2007, p.xxix)

The rest of this paper is organised as follows: proceeding section discusses the barriers to the adoption of health information technology in clinical environments. Section 3 presents the different approaches used by various countries and organisations to tackle the issues successfully. Finally the conclusion is presented in Section 4.

2. Obstacles to Apply Health Information Technology in Clinical Environments

Although the case for adoption of improved health care informatics appears quite compelling, significant barriers to its use remain (Hersh, 2009). Proceeding subsections explains these barriers (Hersh, 2009; Sandsmark, 2008; Gans, et al., 2005; Zenios, 2005; Reynolds & Wyatt, 2011; HFMA, 2006; Goldstein, et al., 2007).

2.1 Initial and Maintenance Cost of Health Information Systems (HIS)

Costs of implementing HIS falls into categories such as acquiring software licenses, training and installation, procuring computer hardware, IT staffing, short-term reduction in productivity due to learning effects, short-term loss of revenue due to billing, and system upgrading (Zenios, 2005). Certainly the biggest impediment is financial since most of the small scale healthcare organisations are unable to bear the above mentioned costs without the help of a funding agency.

2.2 Concerns about Privacy and Confidentiality of Data

'*Many healthcare organizations extend beyond hospitals to neighbourhood clinics, home-health providers, and off-site services such as radiology interpretation and medical transcribers. In this dispersed environment, EMRs are always on the move, and the security of critical infrastructure—networks, PCs, servers, databases, becomes more difficult.*' (Sandsmark, 2008)

Special cultural environment in a healthcare organisation demands security to be a fine-tuned balance between technologies, human elements, standard practices and procedures (Sandsmark, 2008). In many instances the same data set of a patient is accessed by administrative staff, physicians, nurses and laboratory in order to make decisions regarding patient's healthcare. Therefore all those who are involved in the process have shared responsibility and accountability to maintain the security and integrity of a patient record.

2.3 System Interoperability

Various clinical and administrative systems within and beyond a healthcare organization must work together in a smooth manner to give optimum performance. But this does not happen since most of the proprietary software systems by various vendors do not communicate with each other effectively.

Most health care data, whether on paper or electronic format, are trapped in multiple data silos in multiple vendor products. As a result, a patient may have a physician or health system with an advanced EHR, yet if that patient requires care elsewhere, there is little likelihood the information from that advanced system will be accessible when it is needed(Hersh, 2009).

2.4 Fragmented Clinical Data Silos in Heterogeneous Sources

'*All medical data are located in different hospitals or different departments of single hospital. Every unit may use different hardware platforms, different operating systems, different information management systems or different network protocols. Medical data is also in various formats. There are not only a tremendous volume of imaging files (unstructured data), but also many medical information such as medical records, diagnosis reports and cases with different definitions and structures in information system (structured data).*' (Zheng, et al., 2008).

Health care practitioners, providers and patients often make decisions about medical treatments without complete understanding of the circumstances. The main reason for this is that medical data are available in fragmented, disparate and heterogeneous data silos. Without a centralised data warehouse structure to integrate these data silos, it is highly unlikely and impractical for the users to get all the information required on time to make a correct decision. (Shepherd, 2007)

2.5 Lack of a Well-Trained Medical Informatics Workforce to Lead the Process

To maintain an efficient Health Information System, an organisation must have a well trained workforce with a clear understanding of the requirements of both the worlds of medicine and IT. They should be highly motivated to carry out operations and make innovations to support rapidly changing requirements of healthcare industry. This type of a workforce building is a highly time consuming and costly effort.

2.6 Data Storage Requirements

The need for data storage in healthcare grows rapidly. Systems such as Picture Archival and Communications Systems (PACS), which handle digital X-ray, CT, and MRI images use significant storage. These systems are frequently used by most of the healthcare organisations today. Improving the storage environment means more than simply adding better storage hardware. Centralised, standardised storage-management software, which are independent of hardware and are able to manage the diverse, heterogeneous environments that exist in real-world data centers, are important ingredients in the ideal storage prescription. This also should include maximising utilisation of existing storage, improving backup and recovery performance, and classifying structured and unstructured data to improve archiving and retrieval. This last benefit is of particular importance to

clinicians, who need the right information at the right time. (Sandsmark, 2008).

2.7 Problems Related to the Implementation of Electronic Health Records (EHRs)

According to Gans, et al., (2005) the major impediments in implementation of EHRs are lack of support from practice physicians, lack of capital resources to invest in an EHR system, concern about physicians' ability to input data into the EHR, concern about loss of productivity during transition to EHR, inability to easily input historic medical record data into EHR, available EHR software does not meet the practice's needs, insufficient return on investment from EHR system, lack of support from practice clinical staff, practice staff does not have skills or training to use EHR, and security and privacy concerns.

2.8 Medical Practitioners' Resistance to Health Care Software

'*Healthcare is very complex. The paper based and manual processes that have evolved over the last 100 years will not change easily. The need to involve clinicians in transforming processes from paper to electronic media is the reason that often 50% of the expenditures for implementation are not related to technology but to involving clinicians, educating them, obtaining their input, and in supporting them learning by doing. Any technology tool will require humans to run that tool, so involvement, training, careful process mapping and redesign are critical. In the end, medical informatics deployment is more likely to fail due to human factors rather than a failure of technology itself.*' (Goldstein, et al., 2007, p.20)

Physicians' resistance to health care software might occur due to reasons such as the time cost of learning something new, fear of lawsuits, risk of data breaches, fear of automation and deprofessionalisation, and poor track record of existing HIS. (Reynolds & Wyatt, 2011)

3. Approaches to Tackle the Barriers

According to Protti & Johansen, (2010) and Protti & Bowden, (2010) approaches to tackle some of the above mentioned barriers to adaptation of health information technology can be discovered by analysing the success stories of two of the world's leading countries in the use of health care technology, namely Denmark and New Zealand. In Denmark, virtually all primary care physicians have electronic medical records with full clinical functionality, while New Zealand's use of information technology (IT) in health care is among the highest in the world compared with other developed nations.

The findings about the successful approaches as stated in Protti & Johansen, (2010) and Protti & Bowden, (2010) are:

• Peer influence and collegial pressure also played a significant part in the movement to adopt technology in Danish primary care.

• Giving financial incentives for physicians for adoption of Electronic Medical Record (EMR) systems. Including faster reimbursement and additional fees for patient–doctor e-mail consultations.

• Payments for technical support by the government.

• Regular visits by Data Consultants to healthcare practices to train physicians and staff, help practices improve data quality and implement standards, and encourage use of the full functionality of EMRs.

• Peer pressure through public monitoring of participation has been a helpful factor in encouraging EMR uptake in Denmark.

• Placing high priority on the engagement of clinicians in determining the precise content of the EMRs and in setting standards for data.

• In New Zealand the government provides general practices in several regions a one-time grant of approximately NZ$5,000 (US$3,600) to purchase computers.

• New Zealand Government made it a requirement to submit patient disease information to registers and to file fee-for-service claims electronically in order to receive subsidies, combined

with financial incentives for primary care.

•   Most health IT investment has been provided by the New Zealand government via its central agencies.

•   The central government of New Zealand has made core investments into standards development, privacy and security frameworks, infrastructure such as the national health index, and associated systems.

Use of Free and Open Source Software (FOSS) is growing among healthcare oraganisations worldwide as a solution to high initial cost of acquiring a health information system. Open solutions is the next major wave in healthcare information systems. Open solutions was identified as one of nine key healthcare technology trends for 2004 by Healthcare Informatics magazine (Goldstein, et al., 2007).

4. Conclusion

'*EHRs and information technology are essential to solving the problems in medical field only if they are intelligently applied, which require the active participation of leadership, clinicians, patients and all those involved in healthcare*.' (Goldstein, et al., 2007, p.xxx)

Benefits of adopting Health Information Technology in clinical practices largely outweigh the efforts required to overcome the barriers. Some of the above mentioned successful approaches implemented by the governments of Denmark and New Zealand may not be appropriate or affordable for large countries with huge population. Further research and experimentation have to be carried out in order to come up with suitable strategies for overcoming the barriers to adaptation of health information technology in different social, cultural and political environments. While all Australians to have and own 16 digits unique identifier for health related processes and services by 2012, it is worthwhile experiment to revisit the factors effecting adoption of HIT in general (ANHHRC, 2010; National E-Health Transition Authority, 2011).

References

Australian National Health and Hospital Reform Commission (2010). A healthier future for all Australians - Final Report June 2000 Retrieved from http://www.health.gov.au/internet/nhhrc/publishing.nsf/Content/nhhrc-report

Gans, D., Kraiewski, J., Hammons, T. and Dowd, B. (2005). *Medical Groups' Adoption Of Electronic Health Records And Information Systems*. Health Affairs, Vol 24: No 5.

Goldstein, D., Groen, P. J., Ponkshe, S., and Wine, M. (2007). *Medical Informatics 20/20: Quality and Electronic Health Records through Collaboration, Open Solutions, and Innovation*. Jones and Bartlett Publishers, Inc. Sudbury, Massachusetts, USA.

Healthcare Financial Management Association (HFMA). (2006). *Overcoming Barriers to Electronic Health Record Adoption*. Retrieved from http://www.providersedge.com/ehdocs/ehr_articles/Overcoming_Barriers_to_EHR_Adoption.pdf

Hersh, W. (2004). *Health Care Information Technology: Progress and Barriers*. JAMA. 2004; 292(18):2273-2274.

National E-Health Transition Authority. (2011, Febuary 16). *The National E-Health Transaction Authority Strategic Plan*. Retrieved from http://www.nehta.gov.au/about-us/strategy.

Protti, D. and Johansen, I. (2010). Widespread Adoption of Information Technology in Primary Care Physician Offices in Denmark: A Case Study. Issues in International Health Policy, Commonwealth Fund pub. 1379: Vol. 80

Protti, D. and Bowden, T. (2010). Electronic Medical Record Adoption in New Zealand Primary Care Physician Offices. Issues in International Health Policy, Commonwealth Fund pub. 1434 Vol. 96

Reynolds, C. J. and Wyatt, J. C. (2011). Open Source, Open Standards, and Health Care Information Systems. Journal of Medical Internet Research. Retrieved from http://www.jmir.org/2011/1/e24/

Sandsmark, F. (2008). *Best Medicine: Five Healthcare IT Challenges and Cures*. CIO Digest, April 2008, 12-15.

Shepherd, M. (2007). *Challenges in Health Informatics*. IEEE. Proceedings of the 40th Hawaii International Conference on System Sciences.

Zenios, S. (2005). *Information Technology in Health Care Systems: Barriers to Adoption*. Proceedings of the International Multi-Conference on Computing in the Global Information Technology (ICCGI'06), IEEE Computer Society.

Zheng, R., Jin, H., Zhang, Q., Liu, Y., & Chu, P. (2008). Heterogeneous Medical Data Share and Integration on Grid. IEEE. International Conference on BioMedical Engineering and Informatics.