THE IMPLEMENTATION OF ELECTRONIC HEALTHCARE RECORDS WITHIN THE IRISH HEALTH SERVICE: AN ANALYSIS OF USER ATTITUDES

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(Paper Type: Postgraduate Paper; Track: Knowledge Society)

1. INTRODUCTION

An Electronic Healthcare Record (EHR) contains past, current, and prospective information about a person's medical history in a secure computerised format, in such a way that it may be accessed and shared by a number of authorised users e.g. healthcare professionals, hospital administrators (Häyrinena et al., 2009; Veselý et al., 2006). EHRs can potentially deliver many benefits, their primary goal being to improve the efficiency and effectiveness of information management and decision-making within the health service.

However, the rate of EHR adoption in practice to date has been slow (Gans et al., 2005; Lobach & Detmer, 2007). Despite an aspirational EHR roll-out plan announced by the Department of Health & Children (2001) and a subsequent recommendation by the Information Society Commission (2004) that "Ireland must significantly increase its investment in eHealth technology and applications" as a strategic imperative, very little progress has as yet been made with regard to a national EHR system in Ireland.

There has been a number of high profile and costly e-government systems failures within the public sector in Ireland in recent years, including the PPARS project and the abandonment of electronic voting. Similarly, the national implementation of an EHR system is prone to considerable risks and problems. This study therefore sought to investigate the attitudes of Irish healthcare workers towards EHR systems, with particular emphasis on the technical and socio-technical factors that may impede future roll-outs of this potentially beneficial technology.

2. LITERATURE REVIEW

2.1 The Potential Benefits of Electronic Healthcare Records

Bakker (2007) claims that Electronic Healthcare Records (EHRs) will become an important tool in healthcare management because integrated services can be delivered to users by various healthcare professionals at various locations and points in time. For a healthcare professional who is actively treating a patient, it is often necessary to know the data recorded by other healthcare workers who have dealt with the same patient because such data gives information on the health status of the patient, current and previous medication, allergies, diagnoses from other episodes of care, results of examinations, etc. In order to achieve efficient and high quality care of patients, comprehensive and accurate information about patients' health must be provided and managed. Additional features that can be integrated with EHRs include medical guidelines, reminder facilities, checking facilities, and decision support facilities.

EHRs can be used across all areas of the health service, from primary care (e.g. General Practitioners' clinics) to secondary care (e.g. a specialist centre following GP referral) to tertiary care (e.g. expert treatment in a hospital). Currently, the norm in Ireland is that each physician who sees a patient for medical treatment creates and maintains a separate medical record for that patient. With the use of an integrated EHR, this duplicated effort could be eliminated through the shared collection and storage of a patient's details. Kukafka et al (2007) make the point that a large proportion of the data relevant to public health management derive from clinical data and these data should be collected once and then re-used, rather than collected repeatedly by different users. Repeated collection of the same data by different individuals introduces needless data collection burdens, as well as data entry error. A public health oriented EHR system would offer many opportunities for high-quality population-level research by improving data quality, pooling it, and making it available for analysis through traditional epidemiological or data-mining methods (Kukafka et al., 2007; Stausberg et al., 2003).

The impetus to implement EHRs mainly derives from the inherent inefficiencies and troublesome issues associated with paper-based systems (Safran & Goldberg, 2000). With paper-based charts, numerous problems can be encountered, such as bad handwriting, poorly organised documentation, or missing or ambiguous data. The use of EHRs can immediately resolve many of these issues and improve the quality, accuracy, and efficiency of the services provided. EHRs also promise improved quality of care, increased completeness and legibility of documentation, increased efficiency, lower costs, reduced storage space, reduced frequency of data loss and medical errors, immediate access to information at widely distributed sites, vast clinical data warehouses, improved workflow, and the opportunity to use intelligent decision-support technologies (Hier et al., 2005; Veselý et al., 2006).

2.2 The Adoption of EHR Technologies in Practice

Hu et al. (1999) make the indisputable point that "regardless of potential technical superiority and promised merits, an unused or underutilised technology cannot be effective". User acceptance is a critical element to the successful adoption of information technology in the workplace. Computer systems cannot improve organisational performance if they aren't used. Unfortunately, resistance to information technology is a common problem in organisations. To better predict, explain, and increase user acceptance, we need to better understand why users accept or reject new technologies (Davis et al., 1989). Goldschmidt (2005) comments that:

> "To date Health Information Technology (HIT) has been mostly the realm of enthusiasts. Practitioners have generally regarded EHR's as costly, cumbersome, and offering little help for tasks at hand. Many still doubt they are ready for widespread deployment. Estimates of the number of physicians and hospitals that have adopted an EHR are varied and unreliable, due in part, to variability in what constitutes an EHR, they vary in sophistication and are not interoperable."

One issue that has affected the uptake of EHR technologies is the exclusion of patients, who typically are not afforded a facility to record information about themselves (Staroselsky et al., 2006). Another issue is convincing people to embrace the technology; Currie & Guah (2007) suggest that while the government and media have narrowly focused upon the technical aspects of EHRs, a significant challenge is to win the hearts and minds of those who are expected to adopt the technology. The security risks of archiving and retrieving computerised patient records are also an important factor, with the consequent need to implement and enforce regulations to safeguard the privacy of medical records e.g. reliable

user authentication schemes. Other considerations that may impact successful EHR adoption include the cost and return-on-investment of the technology, the lack of interoperable standards, staff training, the complexity and fragmentation of data, different national legislation on privacy and consent, clinicians' fear of data entry, and staff aversion to making information available (e.g. because of law suits and tribunals). Notwithstanding the many non-trivial issues associated with the implementation of EHR technology, it has been articulated by many national governments as a priority objective in the short- to medium term. For example, in the USA, $19 billion has been committed to healthcare IT under the American Recovery and Reinvestment Act of 2009 with the affirmation that the national recovery plan "will invest in electronic health records and new technology that will reduce errors, bring down cost, ensure privacy, and save lives" (Obama, 2009).

3. RESEARCH METHOD

Given the claimed potential of EHR technology to radically enhance healthcare provision, the objective of this study was to investigate the attitudes of Irish healthcare workers towards EHR systems, with particular emphasis on the technical and socio-technical factors that may impede future roll-outs.

Considering the nature of the research objective, a qualitative approach was chosen. This paper is based on a case study and a series of semi-structured qualitative interviews, conducted over the course of a number of months in 2008, with 22 healthcare / IT professionals attached to a major regional hospital based in the west of Ireland. Within this hospital and its associated community care units, most records are currently maintained in paper-based format. Where records are kept in electronic format, they are generally stored in systems that are not directly linked to other systems. As such, this hospital is a good setting within which to investigate attitudes towards EHR technologies, both positive (e.g. overcoming the problems of the paper-based systems) and negative (e.g. resistance to new technology and work practices).

There are many powerful stakeholder groups within the healthcare sector (Lapsley & Llewellyn, 1998), each of which can influence the ultimate success or failure of a system. The interviewees were therefore purposefully selected in order to include a diversity of roles and responsibilities: 8 managers, 3 in-house IS staff, 2 community care workers, 2 medical records staff, 5 nurses/clinicians, 1 physiotherapist, and 1 General Practitioner (GP).

The data analysis method employed was a hybrid, mainly based on the procedures of grounded theory (Locke, 2001; Strauss & Corbin, 1998), but also informed by the general principles laid down by Miles & Huberman (1994).

4. FINDINGS

4.1 Perceived Benefits of EHR Technology

All of the persons interviewed were well informed about EHR technologies and see them as a great opportunity to enhance the health service for the patient as well as providing benefits to healthcare workers in all areas of the hospital. All interviewees see the key benefit as being the universal availability of the patient's record. Having a patient's records available would mean that a patient would receive better care because their full medical history would be available, irrespective of time or location. This could also enhance communication between the GP and the hospital, because correspondence would be faster and the GP could be more closely involved in the patient's care.

Furthermore, all interviewees were of the opinion that EHRs can overcome the shortcomings of paper-based records. For example, if a change is made to a record by a GP, clinician or any other authorised user it means that this information is available for everyone to view, whereas a major problem with the present paper-based system is that letters are often sent to an incorrect address. Having access to a complete EHR would also eliminate the potentially life-threatening situation, which is not uncommon, where patients admitted to the hospital forget what medication they are taking, and whose GPs cannot be contacted. With the stress and anxiety of hospital admission, a patient could also omit to mention allergies to medications; EHR systems afford safeguards against this possibly dangerous scenario.

Enhanced patient confidence was also seen a key benefit, as best explained by one interviewee who commented that:

> "The patient sees the organisation more conjoined in its thinking rather than disjointed. For example, currently when a patient moves around the hospital from department to department they are repeatedly asked the same questions, and this causes the patient's confidence in the service to decrease."

If all healthcare providers were permitted to have shared access to a centrally stored record, it would lead to better communication between GPs, hospitals, and community care facilities, which in turn would lead to better patient care. The current practice within the hospital setting that we studied was that there is a reliance on the use of paper-based charts, meaning that only one person can have the chart at any one time for whatever reason they may need it. This is exemplified by the following scenario as communicated by one of the interviewees:

> "Suppose we are looking for a patient's medical records while he is attending a clinic here in this hospital. Tomorrow that same patient might be attending a clinic in [a part of the hospital on the other side of the city] and the records are required there. Meanwhile a secretary here needs the same records to compile a report. [The health insurance company] also needs the record along with the HIPE department for coding. All of these people have legitimate needs to access the records, but it is very difficult to manage a paper-based system to cater for those competing needs."

Another potential benefit the interviewees highlighted pertains to the amount of time spent each day sourcing, filing, and tracking paper-based charts, a problem that would not exist if EHRs were available. An astoundingly large percentage (estimated to be of the order of 50%) of medical charts containing sensitive information have been known to "go missing" somewhere within the hospital. Users of the Hospital In-Patient Enquiry System (HIPE) have a long-running frustration with the present paper-based system because they must physically source and access patients' charts in order to code them; these users feel that EHRs are the solution to the problem. Another benefit is that forms for medical insurance companies could be filled electronically, thus saving a lot of time.

A number of interviewees commented on the potential benefits of EHRs as useful auditing tools, report generators, and for conducting research. Within the hospital environment, numerous audits are continually being conducted, the majority of which currently use manual data gathering processes. Similarly, a lot of laboratory reports and various other statements which are now being "done by hand" through slow tedious processes could be automated if an EHR system was in place. One interviewee said that an EHR system would be "one of the best research databases in the world"; at present, research is carried out using information that is extracted from the existing systems, many of which were not originally designed with

researchers' needs specifically in mind. An EHR system could provide much clearer, current, accurate and precise data for statistical analysis, but for this to happen would require clinical guidelines and procedures to ensure that everyone collects data in the same way (which is not presently the case with a mixture of various computerised and paper-based systems in use). From a medical-legal perspective, there is currently no guarantee that when reports are sent to hospital wards, GPs etc. that the reports are being read at all. With an EHR system, it would be possible to include status "flags" to check that urgent and important results are not missed.

4.2 Perceived Barriers and Impediments to EHR Implementation

One of the main barriers to the adoption of EHRs in Ireland, which was alluded to by all interviewees, is the lack of adequate funding for a project of the scale involved. Funding within the Irish health service is generally allocated to hospitals on the basis of annual requests which are evaluated and prioritised, whereas in other countries where EHR systems have been implemented there typically are rolling budgets in place. With a rolling budget, there is a greater chance of a €5m project being granted funding than with annual budgets where the likelihood of securing backing for an investment of such magnitude is considerably less probable. Over the years, a number of poor expenditure decisions have led to bad publicity for the Irish health service, such as the abandonment of the PPARS project which was originally estimated to cost €9m but eventually cost over €200m (CAG, 2005). Spending in the health sector is heavily scrutinised by the media, with the result that expenditure on potentially risky IT projects is conservatively managed for fear of receiving adverse attention. There is a feeling that the general public would much rather see money spent where it can be seen (e.g. new beds and equipment) than on back-office IT systems whose front-line benefits are not obvious. There is a widely held perception that the Health Service Executive (HSE) is top-heavy on administrative staff and is rife with inefficiencies, and while EHR systems could potentially eliminate wasteful effort and lead to cost savings, such new technologies are low on the list of priorities because their immediate benefits are harder to justify. The initial investment needed to implement EHRs is quite substantial, and because of the risk of failure there is a reluctance to invest.

As a consequence of the one-year-at-a-time funding model, the many hospitals and agencies within the Irish health service have to a considerable extent operated independently of each other and have thus ended up "re-inventing the wheel" in many regards, building disconnected "islands of information" which have now become legacy systems, many of them being in place for 15 years or more. These systems would need to be upgraded and integrated as part of any national EHR project. As more and more stand-alone piecemeal solutions come on stream, it becomes increasingly more difficult to merge them into one unified system. Although EHRs have been a topic of conversation for over 10 years within the Irish health service, little progress has as yet been made other than brief discussions. As a basic start, there needs to be a focus on taking a lot of the paper out of the system because, as explained by one interviewee, it is not good to have some parts of a hospital completely electronic and other parts still using paper because this inevitably means that paper will creep into the areas that are supposed to be completely electronic; the same interviewee added the caveat that the impetus towards integrated EHR systems needs to be driven nationally. The information that is currently stored in paper-based charts is localised, meaning that it is primarily relevant to the hospital where it was gathered. Current practice means that the format of paper-based patient information differs from hospital to hospital in terms of diagnosis and procedures. Because of this, standard data sets or standardisation of examination codes and pathways are a necessary prerequisite for a national EHR project to work.

Most interviewees mentioned that people's reluctance to change to new work practices would greatly hinder the implementation of an EHR system. Many workers within the health service feel there is no need to change because they cannot see the benefits created by using EHR technology. As explained by one interviewee,

> "You will always have a group of people who oppose anything new just for the sake of opposition and I suppose that's where a good education programme and good training comes in."

Some people believe that "the machine" is going to replace them and their jobs would not be safe if they embraced new technologies such as EHR systems. What such people fail to see is that the development of an EHR system is likely to create other jobs, meaning that it would be a case of redeployment of staff rather than job cuts. Employees would need to be introduced to a EHR system on a phased basis which is fully-supported by service staff and custom-tailored to their needs, in order that they can begin to appreciate the real benefits. For successful implementation of an integrated EHR system, it is imperative that doctors, nurses, GPs, and administrative staff "buy in" to the concept. In particular, a serious impediment to the roll-out of EHR technology is the belief, held by a considerable cohort of healthcare workers, that such technology might be more a hindrance than a help because, in placing a greater administrative burden on healthcare professionals to enter and maintain computerised records, it means the patient may lose out because less time is available for direct personal consultations. As one interviewee put it quite frankly, "the patient is not at the end of the cursor and we must remember that."

The security of computerised EHRs was mentioned by a number of the interviewees. Arguably, there are already data security issues where paper-based patient charts are carried around a hospital and sometimes inadvertently left open to public view, thus compromising a patient's privacy (e.g. records left on trolleys in corridors, or files left open at the reception counter). However, when records are electronically stored, the fear of an unauthorised "impostor" is heightened because of the potential to "hack in" by stealth from afar.

Also with regards to patient privacy, the issue of a national unique patient identifier was cited as a major concern by all interviewees. Although all Irish citizens are currently issued with a Personal Public Service (PPS) number, many people are reluctant to disclose this number because they associate it with their confidential personal finances (e.g. income tax and social welfare). At present, some healthcare IT systems within the hospital setting that we studied use a patient's PPS number (e.g. for medical cards and immunisation records), but other systems use an alternative identifier as explained by one interviewee:

> "[As regards] a unique patient identifier, now we have a local and a regional one called the patient board number, which has worked out very well. There are some issues with that as it needs to be well maintained and we have issues with duplicates, but if it was well maintained it is a model that could be used nationally."

In other jurisdictions, legislation has been put in place in recent years to safeguard the privacy and disclosure of a person's national ID number, but as yet no such legislation exists in Ireland. A number of incidents of data loss by banks and state agencies (including the recent theft of an unencrypted laptop containing patient records from the HSE) has no doubt had an impact on public confidence regarding the security of personal data stored in electronic format. There is an ongoing debate within the field of e-government between, on one hand, the imperative for a state to provide its citizens with efficient and effective public services

and to care for the interests of the "common good" while, on the other hand, protecting civil liberties and ensuring that citizens' personal integrity and security is not violated. These same issues are pertinent to any future roll-out of a national EHR project.

Two interviewees raised the issue of the amount of space needed on the ward for extra terminals. If nursing staff and doctors are required to update patients' EHRs, there will be extra demand on what few computers are currently installed within each hospital ward, with a resultant need for additional terminals. Because floor space is at a premium, the room required for additional computers becomes an issue that needs to be addressed before an EHR could be put in place. Of course, an argument could be made that space previously used for paper files could be used for computer terminals, or that nurses and doctors could use portable bedside devices (e.g. "palm tops"), but matters of staff training and job definition might then come into play.

Finally, another barrier identified by most of the interviewees was infrastructure and architecture. In the Irish context the digital telecommunications infrastructure simply wasn't there until relatively recently and there are still some outstanding issues with it. As regards moves towards a national EHR project, a good start would be to identify a national unique patient identifier, create a backbone network for the whole country, a good broadband infrastructure and standardisation of data information sets. A high-speed broadband infrastructure is vital to the connections at both ends, especially for radiology departments where large image files need to be transferred. However, as yet, a lot of healthcare centres and GP clinics in rural Ireland outside the main centres of population have poor Internet connectivity, and this remains an ongoing impediment to an integrated national EHR system.

5. CONCLUSIONS

The findings of this research identified a number of perceived benefits and perceived drawbacks of Electronic Healthcare Records. It was generally felt that making EHRs more readily available could not only enhance the quality of patient care but also improve the accuracy of data contained in those records. EHRs are seen as tools which have the potential to transform the health service, making it more cost effective and efficient. From the patient's perspective, the use of EHRs could permit healthcare organisations to be more conjoined and integrated in their operations and management.

The main barriers to the adoption of EHRs in Ireland were found to be:

- The need for a high-level implementation strategy driven and funded by government.
- Fear by IT project managers within the Irish healthcare sector of EHR becoming another high profile e-government failure.
- The fragmentation of the healthcare sector in Ireland.
- Problems making the transition from a paper-based system to an electronic system.
- Potential resistance from administrative staff who are fearful of job displacement, or from healthcare professionals who perceive EHRs as more of a hindrance than a help.
- Fear and mistrust of EHR technology by the general public, especially personal privacy concerns.
- Difficulties in justifying back-office IT investment at a time when front-line healthcare resources are under severe strain.
- The lack of adequate broadband communications in many rural parts of Ireland.

Many models of IS usage and success (e.g. DeLone & McLean's model of information systems success, or the Technology Acceptance Model) speak of concepts such as "net benefits" and "perceived usefulness", but it is important to bear in mind that there are many stakeholders where healthcare information technologies are concerned and each individual stakeholder, when thinking about benefits and usefulness, is likely to ask the question "what's in it for me?". Thus for EHR systems to be effective, it is important to understand the intrinsic motivating factors for the various categories of stakeholders, and to put in place extrinsic reward mechanisms linked to those motivators. The findings of this paper clearly point to some perceived benefits that could act as incentives to entice people to adopt this new technology, but it is also clear that there is a considerable degree of apprehension from all sides surrounding EHR technologies that must be seriously considered. Valuable lessons can be learned by examining studies of successful and unsuccessful implementation of EHR systems in other jurisdictions, as well as looking at related areas such as factors impacting the success of CRM/ERP systems in large organisations, factors impacting the implementation of large scale e-government projects, and case studies looking at the socio-technical dynamics of the use, development and management of healthcare informatics.

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