Centralised Health Information Systems: Overcoming the Barriers

GORDANA CULJAK
Department of Information Systems
Faculty of Information Technology
University of Technology, Sydney
PO Box 123
Broadway NSW 2007
Sydney
AUSTRALIA

http://it.uts.edu.au/contact/view/gordana

ANITA KALKVIK
Department of Information Systems
Faculty of Information Technology
University of Technology, Sydney
PO Box 123
Broadway NSW 2007
Sydney
AUSTRALIA
anitakal@gmail.com

Abstract: - *The health sector continues to report that about three quarters of Health Information Systems (HIS) are considered not to have reached the goals of their implementation. This aim of this study is therefore to identify barriers to centralised HIS as the first step towards addressing these issues. This is done by conducting a literature review followed by qualitative analysis of interviews with users at two large Sydney teaching hospitals. The main barriers identified are the complexity of the health care environment; the departmental structure with separate management and funding, standards, cost, management, physician-system relationship and differing opinions between physicians and IT management on the need for centralisation and how it should be done. For a patient-centred approach, national commitment and a shift in mind set it needed.*

Key-Words: Health Information System, Standards, Funding, Management, Technology, Barriers, Adoption.

1. Introduction and Background

productivity of health professionals' work, even though the estimated costs for a large hospital are about $50m [1]. This is what led to the research question: **What are the barriers to implementing a centralised Health Information System throughout a hospital?**

The existing disparate systems have a historical basis [2, 3]. They were developed independently and are the result of separate systems being glued together rather than a central system that was developed to include emerging entities and functions as the need arose. Accounting and administration were first designed to improve efficiency over manual procedures and progressively these applications began to include functions for admission, discharge, ordering laboratory tests and reporting results.

2. Rationale

The HIS has many different users so it is understandable why there are many disparate systems covering all the relevant areas of data flow throughout a hospital at the moment. However, there are also similarities and many departments need the same information; demographics of a patient, or summary of recent assessment. From an IS perspective it is often asked why it is like this and why there is not a centralised system that serves all clinical information throughout a hospital. Other industries have faced some of the same challenges, but moved past them, and it is important that healthcare looks at these barriers to avoid the mistakes of the past [4].

3. Literature Review of Barriers

- There is a large amount of literature that investigates the reasons for IT failure and success in the health care sector. It is believed that a fully integrated health information infrastructure is the key to transform our health system [5]. So why is HIS so often disparate?

4. Research Methodology

The goal of this study was to find out what the people who work with the information systems think of as barriers to HIS. A literature review combined with case studies of two large teaching hospitals in Sydney, were chosen as a suitable and feasible methodology to best assess the research question. Staff were interviewed in order to investigate where they thought there was room for improvement, and to check some of the hypotheses found in the literature review.

Hospital B is in part of a different Area Health Service and has a separate board which is run under the authority of a charity. They are therefore in a position to make their own choices on whether to follow the rest of the Area Health Service (AHS) area or come up with their own solutions.

5. Interviews

Formal interviews of key personnel were conducted at the two hospitals. This consisted of open ended questions designed to draw out insights into centralisation of information systems and barriers at the specific hospital and in general.   To get a complete picture of the use of HIS, a variety of users and interviewees was therefore chosen to be a senior doctor, junior doctor, nurse, clerk, secretary, research user and an IT management representative.   They are all exposed to information systems in their daily work and have different needs and views on enablers and barriers. The semi-structured open-ended questions asked interviewees about by whom and how the system was used, whether there was a hospital-wide policy regarding record-keeping, benefits, suggested improvements, the paperless record, barriers to having one main interface and views on future direction.   The detailed list of questions used in the interviews can be obtained by contacting the author. Since Hospital A had been overloaded with interviews of similar type lately, comparable interviews could not be conducted as initially intended across the two hospitals. The answers from Hospital A were able to be gained however, from one interviewee with a greater general knowledge of the information systems in the hospital and not just from the Emergency Department's point of view.

The two hospitals chosen are both large teaching hospitals but have completely different approaches on the issue of a centralised HIS; integrated and distributed.

Hospital A has chosen an integrated solution where the PAS system is from Cerner HNAM (Health Network Architect Millennium) which they have had for some years. They are now in the process of gradually purchasing and replacing all the other existing CIS with Cerner modules to make it all based on one product.

The relevant Area Health Service has decided on an integrated clinical system, and all hospital in the area will follow the same approach.
"More and more information will be available electronically through the integration with PAS and across the area when getting rid of all the other, old departments information systems." (Patient Records Manager)

Hospital B has chosen a distributed approach where an interface engine called e*Gate makes communication between the different systems possible. An interface engine is software that makes it possible not to have HL7 interfaces between all the different applications. When systems are changed or added the update will be limited to e*Gate. They in the process of changing their PAS system from the old HOSPAS system to i.Patient Manager (from iSOFT).

For integration between two hospitals the health area service uses a product called eIndex, which takes a information feed from both each hospitals' PAS and matchings the last name, first name, sex, date of birth and Medicare number. They are also implementing EDIS on a multi-campus setup throughout the health area, and are aiming for the stage where patient details are entered in the system, it will alert the user to the fact that the patient has been somewhere else.

6. Results

The main barriers identified are the complexity of the health care environment, standards, cost, management, physician-system relationship and

technology. In particular, the department structure of the hospital is a major barrier to centralisation as all departments have separate management and funding. Funding becomes an issue due to the complexity of calculating return on investment and the fact that there is not much money in health care for frequent Information Technology updates. Physicians often are of different opinions than the IT management on whether such centralisation is needed and how it should be done.

7. Interviews

Issues that staff identified are grouped into themes/barriers and presented here. As the results show, they did match some of the hypotheses found in the literature. An outcome that this paper contributes is ideas towards a solution, which are also outlined in the discussed section.

7.1 Complexity
7.1.1 Health Structure
"You'll never have an integrated computer system, until you have an integrated health care system." (Junior doctor).

It seems the nature of health services is something that is considered a barrier also by the industry. There are several places of health care delivery besides the public hospitals; from private clinics, GPs and other hospitals. If time permits, the information can be obtained, but if it is outside of opening hours, the private facilities are closed. This means one must either wait until the next morning (which at the Emergency Department (ED) is not really an option) or go through the information gathering processes over again.

The doctors in particular wish that the systems were able to access patient data extended to other stakeholders, local GPs, and between the hospitals. But as a senior doctor said: *"The exchange of information inside the hospital must happen first."*. Most agree that in some level the EHR will represent a greater component in the future and that electronic clinical information will be shared more broadly to solve these issues. They site financial and technical solutions (they all use different patient identifiers) as

barriers. They believe the electronic version will gradually take over paper, but that a paper component with always remain. *"Bureaucracy seems to want that all info is available electronically, but that is probably not necessary,because I can get it anyway."* (Senior doctor)

7.1.2   Hospital Structure
The department structure has a silo effect on the information systems throughout the hospital. *"The different departments have certain requirements, and the complexity of making it one system must be quite a big job. That is why I think people have tended to do them smaller."* (Junior doctor)

At hospital B the thought is that *"all the small systems are hard to maintain, to support, and it is not cost efficient to have a variety and maintain them all separately."* (PR Manager).

The government puts measures on performance, and the system then measures how well the department is performing; the ability to pick up patients, to record them, to see them within benchmark time. Essentially it is being measured in how effective one is operating within the department, with the departments IT system. This strong focus on the department as an entity does not support a centralised, holistic approach within the hospital.

7.1.3   Approach
So why have the hospitals chosen two so different approaches? The main reasons for choosing an integrated approach is said to be the ease of making the different departments share information and support of an EHR. Also Hospital A invested in the Cerner PAS some years ago, and the basis is already in place to extend it to the other modules. On the other hand one has the argument presented in the funding section, about the modules of a big generic product having limitations on flexibility to fit the specific departments, while their own little individual systems often do not.

So *"why would you stick to one homogenic thing, if this product over here is a better product? Where in this great one, big, homogenous are you going to get everything you want? You're not going to get it. I do*

not believe that anybody can be specialist in everything." (Systems Manager).

The IT management of Hospital B argues that getting products to talk to each other is not the issue it was 5 years ago. Integrated systems are what people thought would be the solution, but it was not, and now there are systems like e*Gate, and all companies will make products that can message and receive from everywhere via HL7 messaging. Even if Hospital A is changing all individual departmental systems, the EDIS will still stand and communicate with the rest. It is done this way because the ED module of Cerner was not satisfactory. According to the IT director at the ED of Hospital B is Cerner (the company who makes the integrated solution used at Hospital A) *"going to make a new emergency department information system, but that will be like re-inventing the wheel, and probably not get any better than EDIS any way. Systems like Cerners' is not taking over health, Cerner is loosing health."*

Another aspect of the integrated products like Cerner is that they are very expensive. There will be big expenses in changing peoples' work patterns from using the old individual systems to implementing a new system. Across a whole hospital, this becomes an enormous amount of things that need to be changed and will take *"5 years, and 30-40 million dollars"* (IT director)

7.2 Funding
"Money is the root of all our problems here. The only reason why we are doing what we are doing is because of private benefactors" (Systems Manager).

The IT director of the health area compares with the National Health Service in England. They have put in many millions of pounds over 5 years to put in place how they are dealing with patients and electronic medical records. They are progressing as planned and have shown that they are serious about it. *"The Australian government have a strategy towards electronic record keeping that within x number of years we'll have EHR throughout Australia, but they need to push hard to get there and not give up."* (IT director).

7.3 Management
There is a lack of national leadership and the independency of the medical profession in general, with many visiting contractors [11] makes it hard to pinpoint responsibility. The way it is divided into Federal, State, and local Health Areas does not help because everybody seems to be doing something different [12]. In general *"hospitals stifle themselves by setting up too many committees. It's like a committee to design a horse. This hospital is really good, and we're still getting old technology. The product we're buying now I saw 6 years ago. Sure that was an old version, but it was not that different from today."* (Systems Manager)

7.4 Physician-System relationship
One of the most common usability issues are complexity of user interfaces and speed of which requests are answered. Also related, is how results are reported to external departments. It can seem unavailable on the clinical webpage, but when called up, the results can be given over the phone.

The resistance to technology is a topic that also arose in the interviews. According to IT management many doctors still think that "*everyone else should do the data input for them, because they're supposed to just be attending the patient. They would like to call up all this information on the drop of a hat.. They don't really see that they're the ones that should be putting it in. Well I'm afraid that it's doctor information, so doctors have to put it in*". (Systems Manager).

The conclusion to this seems to be that there will be resistance, and you have to calculate that into the training programs, but you do not have to accept it. *"Whether they love it or not, it's not the point. They're all using it and that's the point, and that's all you want."* (Systems Manager).

Why did most interviewees answer that they do not find the systems hard to use and find their amount of training adequate for their performed tasks, if proper training is a solution to many of the issues of physician-system relationships? The junior doctor reflected over this and came up with what seems to be the core of the problem: *"…it isn't necessary that*

you can't use the system, but that you don't use it for its right potential. For example I had a teaching session where the lecturer pointed out how you can click on certain things to get results, which I didn't know were there. So it is more being unaware of features that could do your job simpler than making errors in your tasks." (Junior doctor)

7.5 Technology
7.5.1   Access and Availability
When it comes to the technological barriers identified in the interviews, some are related to a lack of knowledge of current technology, and not to the lack of technology itself. It was said by a nurse that a barrier with using computers is that if it crashes, you lose information. The IT manager underlined how this perception lacks knowledge of reality, where backup and redundancy systems of today are very sophisticated, that it is much easier to lose a piece of paper than the information in the computer system. Another issue is that technology is constantly on the move and new gadgets arrive every day is also a bit frustrating; *"what we have in place today is obsolete by next week."* (Clerk)

7.5.2   Security and Identification
A unique patient identifier throughout an area would make it easier to get access to the information needed. Australians have already voted "no" two times for unique patient identifiers. None of the interviewees mentioned the fear of unauthorised personnel getting a hold of the information through hacking or other security threats; the major concern was abuse of the possibility of authorised personnel to lock up their unique identifier and see their whole clinical story. *"I think a unique identifier could do good, but I really don't like the fact that it's got facts like clinical information so easily accessible. The passwords are not individual, everybody knows them, and I cannot see how they can sew that up."* (Systems Manager)

8. Discussion
The findings in the literature and what was discovered in the case studies complemented each other, and many similarities and some differences were discovered in the main areas.

Both the literature and the interviewees agreed on the complexity of health care as a major barrier. With many stakeholders and a variety of functional requirements it can be hard to agree on a common vision for the future. The non-centralised hospital structure makes it hard to apply a centralised approach to data availability and decision support.

Different systems use different standards, and until there is a more uniform approach to defining a common terminology for controlled vocabularies this will cause overhead and hinder processes intended to support automation and generalisation.

The costs of HIS can not be isolated and must be considered a part of the whole [5], but no matter how its considered it, it will still be difficult to provide quantifiable benefits which are needed in an area with competing resources and little money. The separate departmental budgeting and priorities between state government, hospital and departmental level is also considered a barrier to the centralised approach.

The division of Federal, State and district health services do not help either, and everybody seems to be doing something different [12]. There is also the problem with bureaucracy and committees taking time and new technology arriving too late. The theory evidenced in the literature about different levels of training was proven in the study. The users had their functional training for everyday use of the system, but lacked knowledge about the vision of electronic record keeping.

The relationships between the physicians and the systems have a lot to do with how efficient the systems become. If they are not found attractive by the physicians, it does not matter how much functionality it contains. Besides, the physicians need to learn to trust the systems and the data in them. Resistance to change can be overcome by making integration in the process of development, to make people feel they are a part of the system, and that it is not just forced on them from someone who does not understand their position.

Health personnel need to realise that they are more likely to loose a piece of paper than an electronic record, and that the solutions for replication and backup are not a significant barrier anymore. This is an area where lessons could be learned from other industries.

The major technological problem in Australia is the lack of Unique Patient Identifiers (UPI), and a security system where all authorised personnel have the same access rights.

9. Conclusion

The main problem to centralised data sharing in this area is how the entities are not built to collaborate and communicate with each other. This silo effect is reflected in many of the other barriers too, and is one of the main reasons why integration is difficult. Standards are needed for effective communication between separate systems both on the messaging and the clinical coding level, and even if the main problem with costs is a lack of funding, the separation of management and budgeting makes it hard to collaborate towards a common goal of a more centralised system because of different priorities and different availability of money.   Even though some of these barriers seem like fundamental errors in how the health care system is built, it is not too late to start making changes. Through a component based approach which is open to flexibility, and a system that is integrated with the clinical workflow, it will be possible to overcome many of these issues.

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