Information Age, Electronic Health Record and Australia Healthcare

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Abstract

The emergence of the Internet has impacted the health information and the healthcare industry. The information revolution has reduced the distance between the healthcare providers and consumers. It permits easy dissemination of information and fast accessibility of data. Because of easy accessibility, privacy and confidentiality has become an important issue to be considered in the implementation of electronic health record systems. As different electronic health record systems are in use in different healthcare institutions, integration of electronic health record systems becomes a major issue. Data interoperability, data standards, data quality and data integrity all need to be considered in linkage of disparate legacy systems.

This paper discusses the emergence of electronic health record systems, the effects of information age on health information from the healthcare providers perspective, healthcare consumer perspective, Australian healthcare industry position and our experiences of linking electronic health record systems in collaborated projects.

1. Introduction

Networking of computers started after the emergence of ARPANET. This caused changes in economies, markets, industries, and customers' behaviour resulting in the emergence of e-business, including e-commerce, e-banking and e-auctions in the business and financial sectors. The Internet has triggered an information revolution, which impacts the way different industries work. Healthcare is not an exception, and it is evident that there are changes in the process of healthcare and healthcare industries.

It can be seen that health information is widely available on the Internet, and consumers can access health information easily from the web. Healthcare providers can search medical literature from medical databases free of charge, for example Medline [1]. Internet has supported and revolutionised different fields of study and work, and it is necessary to get its utmost assistance in the healthcare system. With this as the target area, this paper stresses the importance of electronic health record and Australia Healthcare.

2. Emergence of electronic health record systems

Healthcare industry started to use electronic health record systems in the late 60s and early 70s. When it was started, most systems were networked within their own healthcare institutions, i.e. Intranet. PROMIS (Problem Oriented Medical Information System) and ARAMIS (The American

Rheumatism Association Medical Information System) are two systems that started around 1970. With ARAMIS time oriented medical record system, the search speed for the medical record is four times as fast as the traditional paper based record [2]. PROMIS was developed in 1969 at the Vermont Medical Centre. It includes Subjective observation, Objective observations, Assessment and Plan. PROMIS did not survive because it had no advantages over paper- based records. The primary purpose of the ARAMIS was to serve as a national research data bank for the storage and disclosure of the longitudinal data of chronic rheumatologic disease.

In the 1970s and 1980s, several computer record systems were used in the medical disciplines, completely integrated with the hospital information system. Regenstrief (Indiana University, Indianapolis), STOR, Summary Time Oriented Record (University of California, San Francisco), HELP (LDS Hospital, Salt Lake City), TMR, The Medical Record (Duke University, Durham), COSTAR (Harvard Medical School, Boston), Center for Clinical Computing (CCC)(Beth Israel Hospital, Boston), DIOGENE (University Hospital, Geneva) are examples of systems that are still operational and used in various institutions [3].

The W3 EMRS system, started in 1994, is a well-known system collaborated among Boston's Children's Hospital, MIT, and Albert Einstein College of Medicine joined together with the Laboratory for Computer Science at Massachusetts General Hospital and the Centre for Clinical Computing at Boston's Beth Israel Hospital [4]. As stated earlier, electronic health record systems emerged in healthcare institutions in the late sixties. With the advances and development of technology, different health record systems (emphasising on different developments) have been developed in healthcare institutions throughout the world. Electronic health record systems developed within intranet or local area network, within the organisations in earlier days. However, currently, there are personal health record systems available via the Internet. Personal health record systems allow health information of individuals to be available through the secured websites. The individual's health information could be under the shared control of individual and its health care provider [5]. Personal health record system enhances consumers' involvement in healthcare, as it enables consumers to create and maintain their own health information.

3. Information accessibility

With the change in usage of medical record systems from paper based to electronic record systems, there is an increased accessibility of information among healthcare providers. Because of increase accessibility, healthcare providers have better informed decision making regarding patient's health. It thus makes it beneficial to patients as well as to the health care institution and healthcare industry in general.

3.1 Healthcare providers' concern

As stated above, electronic health record systems emerged in different health care institutions and fragmented in different health care institutions.

3.1.1. Integration. It can be seen that different electronic health record systems are in use in different health care institutions around the world. It would be complicated to access a variety of databases, implemented in different technology [4]. Integration and linkage of data appropriately becomes important for accessibility. To integrate data effectively, patients should be uniquely identified [6]. Unique identifiers would enhance the proper linkage, and would assist

the rapid and accurate identification of the record [7].

3.1.2. Data interoperability.

Interoperability plays a major role to maintain the workflow and availability of health information [8]. To exchange data efficiently among systems, i.e. systems to be interoperable, different systems need to use the agreed messaging standards.

3.1.3. Data quality.

Data quality of electronic health record systems is important, because appropriate information available will assist in the healthcare decision-making process. Accuracy and completeness are most cited data quality attributes for the health information [9], because inaccurate or incomplete information can have impact on research and disease surveillance [10].

In the United Kingdom, because of the millennium bug error, incorrect Down syndrome test results were sent to 154 pregnant women. Because of that four Down syndrome babies were born to mothers to whom their tests put them in the low risk group. Two terminations were carried out as a result of mistaken test reports [11]. In this case, because of the millennium bug, the ages of pregnant women were wrongly recorded in the system and the inaccurate data caused major impact in the health outcome.

4. Consumer Perspectives

Information age causes changes in the dynamics of communication between patients and healthcare providers, and healthcare providers among themselves [12]. Easy accessibility of health information causes consumers to be more involved in healthcare decision making.

Consumer involvement increases, as the use of information technology in healthcare increases. Consumers can access the health information easily from the web pages available on the Internet and there is more consumer awareness of health information. Healthcare consumers become more involved in healthcare decision making. The focus of healthcare has changed from healthcare providers' paternalistic approach to consumer consent based approach [13].

There is increase in patients' rights and consumer's rights. In earlier times, public libraries had resources primarily for the healthcare providers but increase in consumer rights provide an electronic library of resources on internet and established multiple free mechanisms for accessing the resources [14].

There are suggestions of new patient record systems so that health records will not only be available across the healthcare institutions but will also be accessible by patients for managing their own health [15]. It is obvious that healthcare changes from health information, hitherto only available in healthcare providers institutions, are now widely available to healthcare consumers.

5. Privacy and Confidentiality

Electronic health record includes patients' sensitive health information and if the information is disclosed accidentally or unintentionally, there could be detrimental effects on the patient [16]. Misuse of patient data may harm patients and undermine the quality of healthcare [17]. Therefore, electronic health record systems need to build the consumer and healthcare provider trust to have full usage of the system. Electronic health record systems available through network are more vulnerable to attacks and misuse. Proper security measures such as encryption, public key infrastructure, firewall and network service management, software management, rights management tools and system vulnerabilities management tools would provide more security for electronic health record systems [18].

There are a lot of incidences of breach of confidentiality of electronic health record systems. A hacker infiltrated the University of Washington Medical Center's computer system and stole at least 5000 cardiology and rehabilitation medicine patients' records [19]. In another incidence, a Dutch Hacker had pointed out the vulnerabilities of the system, because he had penetrated an unidentified medical centre in New York and another in Holland [19]. The University of Michigan Medical Center patients' records were left exposed to the public on the Internet because they thought that they were on a special server protected with special password [20]. It was an innocent mistake but the patient's confidentiality was breached. The case of the Florida state public health worker who sent the names of 4000 HIV positive patients to two Florida newspapers was a case of abuse of access privilege and access for the purpose of profit.

Therefore, proper privacy legislation is needed to ensure the privacy and confidentiality of the electronic health record. In the United States, Federal Register, Health Insurance Portability and Accountability Act of 1996 (HIPAA) and National Committee on Vital and Health Statistics have strongly emphasized the importance of health privacy [21,22]. The National Research Council has discussed in detail the limitations of Federal and State protection, technical approaches and organizational approaches for protection of privacy in medical records [23].

To ensure that technology assists society without compromising the trust of the public and private sectors, appropriate privacy legislation is needed. Commonwealth Privacy Amendment (Private Sector) Bill 2000, an extension of National Privacy Principles [24] contained in the Privacy Act 1988 [25], has been introduced in Australia and it has special provisions for protection of health information. In Australia, Parliament passed the Health Record and Information Privacy Act (HRIPA) in 2002, and it would come into effect in March 2004. HRIPA would provide control on the issue of unique patient identification and the way health records may be linked [26].

Therefore, privacy and confidentiality of health data is important for the successful implementation of electronic health record system. Thus, quality, privacy, interoperability are important for the successful integration of electronic health record systems (figure 1). Health information available through electronic health records and health information available through the Internet enhances communication between healthcare providers and healthcare consumers. Better information decisions can be made through the information availability and it enhances health information knowledge management. Therefore, technology enhances health information availability; the following figure represents how they might be related.

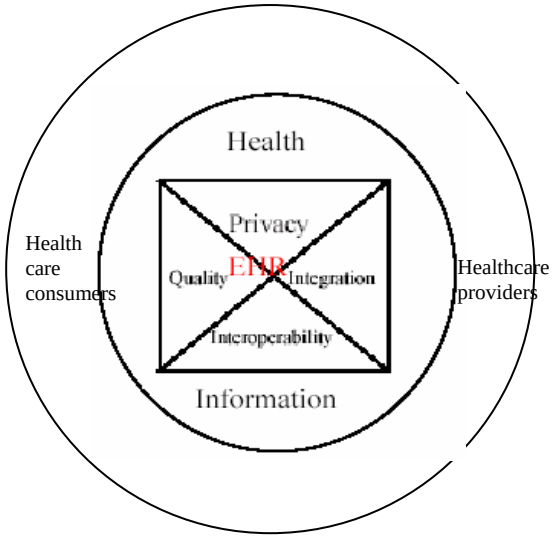

Figure 1: Health information, electronic health records and healthcare industry

6. Electronic Health Record and Benefits

There are a lot of benefits from using electronic health record systems, namely increased accessibility, better

communication between primary and secondary care providers, improved timely access to care, better-informed decision making. Electronic health record systems, which include reminders, and alert would improve immunizations and prescriptions.

At the Good Samaritan Regional Medical Centre in Arizona, a comprehensive prescribing support system alerted 1116 times during 13521 admissions over a six-month period. That amounts to alerting serious risk of 64 per 1000 admissions; 44% of these were not recognized as risk situations by the physician prior to the alert [27].

Teleconferencing system that integrates with telemedicine and electronic health record systems provide a virtual workspace for participating physicians [28], and this enhances better communication and better decision making.

7. Electronic Health record and Internet usage in Australia

In Australia, National Electronic Health Records Task Force was established in 1999 to develop a national framework for the electronic health record system. In July 2000, the National Electronic Health Record Task Force recommended to National Health Information Management Advisory Committee, the establishment of general approach to a component for the network, privacy and confidentiality, standards, telecommunication infrastructure and uptake and use of information technology [29].

7.1. Electronic health record status in New South Wales (NSW)

NSW also has targets for full implementation of electronic health record systems. The implementation of a Patient Centric Referral Network (PCRN) across NSW is a logical step towards a NSW electronic health record. There are well known systems currently in use in NSW, namely Patient Administration Systems (PAS), Progressive implementation of Point of Care Clinical Solution (POCCS) across the states, the roll out of the Community Health Information Management Enterprise (CHIME), Implementation of the Ambulatory Infrastructure project and State Unique Patient Identifier. These will be the main inputs to the Electronic Health Record System by 2010 [30].

7.2. Projects collaborated with University of Wollongong

The University has collaborated to link the disparate legacy databases on Maternal and Infant Health Records of the South Western Sydney Area Health Services, Maternal and Infant Network (MINET) for healthcare research [31]. There are a lot of challenges in matching, as one individual may have many identifiers as they have consulted different healthcare providers, marital status changes and name changes, more than one person may have same medical record numbers and these highlight the fact that unique identifiers are of utmost importance in linking the databases. Integrated MINET databases assist clinicians to review their services. Information available from MINET assists in public health services, such as for public health policy, strategic development and evaluation [32].

University of Wollongong has collaborated with the Illawarra Division of General Practice (IDGP), and developed a Smart-ID system to facilitate different healthcare providers to access patient's data stored in the central server without compromising the privacy, ownership and confidentiality of the patient [33]. In this project, the GP involved in the project can access to the particular Diabetic patient's record located on the server at the IDGP via Internet. To access the record both the GP

and the diabetic patient need to have the access key, smart card or USB intelligent keys [34].

7.3. Internet usage for health in Australia

According to the second annual Australian e-health study 2002, about 1.4 million Australians over the age of 15 use Internet to find out information about the medical condition and health information in general [35]. In Australia, based on the survey of 744 General Practitioners and 1631 Specialists, 46 percent of medical practitioners, i.e.31 percent of General Practitioners and 53 percent of Specialists use the Internet as a reference tool in their day-to-day practice [35].

8. Discussions and Conclusion

Information age and networking cause changes in most industries. It can be seen that uptake of technology is slower than in other industries. In banking, banks started giving all their staff access to all customer accounts in 1980s [36]. Although the uptake of technology is slower than the other industries, it can be seen that healthcare has benefited through information available on the Internet. Healthcare consumers find out health information from the Internet and the General Practitioners use Internet as a reference tool for health information. It can be seen that information age has positive impacts on healthcare through availability of health information from the Internet. As in other industries, it breaks down the geographical distance and increase connectivity among healthcare providers, healthcare providers and consumers.

Privacy and confidentiality issues are of major concern in healthcare industry's slower uptake of technology. Countries around the world have developed privacy legislations and principles to enhance the confidentiality of the data and proper disclosure of information.

Emergence of information age and information revolution causes vast changes to healthcare, information transfers and access. Electronic health record systems were developed at healthcare institutions around the world. Culture of the healthcare changes from the healthcare providers' paternalistic approach to the combination of healthcare and consumer focus approach. Consumers play a major role in the personal health record systems and the Smart-ID system. It can be concluded that information age has a profound effect on the healthcare. The availability of the online health information, emergence of different health information systems and involvement of healthcare from both healthcare providers and consumers are positive impacts of information age in healthcare industry.

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