Critical Factors Affecting EMR Adoption in Taiwan: A View of Hospitals

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摘要

電子病歷系統對病患、醫師和醫療機構具有潛在實質效益，2007 年起在衛生署推動下十一家醫學中心開始進行可互通電子病歷的試辦計畫。由於較少文獻針對醫院採用可互通電子病歷的障礙及挑戰進行研究，以致醫院考慮採用電子病歷時缺乏可參考的背景資訊。因此，本研究透過問卷調查及專家討論方式蒐集醫院相關意見，針對影響醫院採用電子病歷的障礙及關鍵因素進行探討，研究結果發現「對醫師的誘因」、「系統的互通性」、「病患資訊的安全與隱私」，以及「所造成的社會及組織變革」等因素將影響醫院對電子病歷的採用。針對這些關鍵影響因素，本研究參考他國推動經驗，提出相關政策建議，以提供政府及相關機構參考；期能有助政府制定有效政策，移除推動障礙，加速電子病歷的互通及使用。

關鍵字：電子病歷、台灣電子病歷內容基本格式標準

Abstract

Electronic medical record (EMR) systems have the potential to provide substantial benefits to patients, physicians, and health care organizations. In 2007, the Department of Health (DOH) has set up an interoperable EMR system project among eleven medical centers. Since few studies address the barriers and challenges of interoperable EMR adoption in Taiwan, very little background information can be provided to assist pilot hospitals when considering EMR adoption. Therefore, we performed a survey to assess barriers to and critical factors in adopting an EMR system in these participating hospitals. Using a questionnaire survey and expert panel to solicit opinions from hospitals, our study identified several major issues affecting the adoption of an EMR system including "incentives for the clinicians", "interoperability of systems", "security and confidentiality of patient information", and "social and organizational change caused by EMR". Several suggestions were proposed to the government and stakeholders based on these critical factors identified and experiences of other countries. With a better understanding of these critical factors, the government can develop enabling policies to break down the barriers and facilitate the widespread of interoperable EMR in Taiwan.

***Keywords**: Electronic Medical Record (EMR), Taiwan Electronic Medical Record Template (TMT)*

1. Introduction

Electronic medical record (EMR) systems have the potential to provide substantial benefits to patients, physicians, and health care organizations [7][8]. Such systems are starting to be used in Taiwan and other countries[3,4] because of these benefits. A five-year information technology project, called National Health Information Project (NHIP), was initiated by the Department of Health (DOH) of the Government of Taiwan to establish a nationwide infrastructure for electronic medical records and health information exchange [3][6]. The DOH estimates that EMR adoption nationally will reduce medical care expenditures by at least NTD 10 billion.

Under the DOH's plan, full implementation of EMR for all hospitals is targeted for 2011. As a first step, a pilot EMR systems adoption project was set up among eleven medical centers starting in 2007. An important aspect of the pilot projects is the use of the Taiwan Electronic Medical Record Template (TMT), a format for interchange of data amongst EMR systems [4]. Through this pilot project, the DOH expects to improve the EMR system interoperability among hospitals and thus achieve the NHIP vision of "giving health information back to the people" [3].

Despite potential benefits of EMRs for hospitals, very little background information is available to assist hospitals when they consider adopting EMR systems. Not many studies have been performed to understand the barriers and challenges of EMR adoption in Taiwan. The experiences of other countries such as the US may not apply fully due to the differences in the healthcare systems and the underlying financial models. Therefore, we conducted a qualitative study to assess barriers and critical factors in adopting an EMR system in these participating hospitals. The study solicited opinions from experts via panel discussions and from pertinent hospital staff using open-ended questionnaires. The results of our study will guide us in creating policies and strategies for successful adoption of EMR systems in the pilot project and for wider deployment subsequently.

2. Background

Due to the large volume and variety of patient services offered, medical centers in Taiwan have a great need for exchanging health information with other healthcare organizations. Thus, eleven medical centers joined this pilot EMR exchange projects voluntarily when the DOH called for participation in 2007. Of them, five medical centers are located in northern urban area, three in central urban area, two in southern urban area, and the other one in eastern suburban area of Taiwan. These participating hospitals provide thousands of outpatient and emergency visits daily and have inpatient beds ranging from 630 to 3,000. All of these hospitals have implemented computerized physician order entry (CPOE) systems since several years and some have implemented EMR systems recently.

To improve the EMR system interoperability among hospitals, the DOH has developed TMT, a format for exchange of medical information nationally [3][4]. The DOH has provided a server and a free software tool which is able to transfer each hospital's code sets to TMT-mandated codes in this project. The TMT standard is based on the HL7 Clinical Document Architecture Release 2 schema [4]. A complete EMR browser system has been created which allow hospitals to easily integrate it with their CPOE systems seamlessly through the conversion of their own EMR formats and TMT.

EMRs will be deployed in two forms in this project. One form is a web-based system which provides an integrated EMR for the clinicians. The other form is named "Health Key" which consists of a mobile USB disk provided by participating hospitals at the patients' request. In these two forms, the medical records include data about outpatient episodes, outpatient prescriptions, referrals, laboratory and examination results, inpatient admissions, discharge summaries, et al. All these data are recorded in the TMT format. Patients also can choose to keep the records themselves or allow the institutions other than hospitals to keep the record for them [3][4].

3. Methods

In this study, our two approaches include (1) a survey of hospital personnel, and (2) expert panel discussions. First, we conducted a survey to explore in-depth, the difficulties encountered by a hospital in adopting an EMR system. An open-ended questionnaire was designed based on literature review and consultation with the expert panel. Only two questions were included in this questionnaire: In your opinion, what are anticipated problems of adopting an EMR system in your hospital? What aspects of issues should be addressed during the adoption process of EMR? The questionnaire suggested that users consider several aspects that hospitals typically encounter in the EMR adoption process: information system, workflow, medical record management, organizational change, security and confidentiality, and education and research [2][3][5][7].

A seminar was held in May 2007, prior to administering the survey, to help respondents understand the goals of the pilot project. A briefing of the project was provided with the questionnaire to study participants. Thirty participants were invited from across departments that would potentially be involved in EMR adoption, such as medical informatics, medical records, medical affairs, and clinical departments at the National Cheng Kung University Hospital (NCKUH). Of these, 20 staff members returned the completed survey. The length of time to complete a questionnaire for each respondent was 20 minutes on average.

Following the survey, panel discussions were used to obtain opinions from experts nationally. Experts from hospitals, schools, research institutions, and businesses in the medical informatics field were invited to discuss the challenges to and their recommendations for EMR adoption in Taiwan. Three expert panels were convened separately, each for half a day. Two expert panels were held at NCKUH by the Taiwan Association of Medical Informatics (TAMI) on 8^{th} of May and 14^{th} of September, 2007. The other expert panel was held by the Taipei Computer Association on 10^{th} of August, 2007.

There were approximately 40 experts participating in each panel discussion, including hospital administrators, clinicians, hospital IT directors, medical records directors, vendors, and researchers. Prior to the panel discussions, the experts were provided with a briefing of the NHIP and documents prepared by TAMI describing factors in EMR adoption including infrastructure, interoperability and standards, supporting mechanism related to application domain, security and legal concerns. About 30% of the experts provided written opinions after the panel discussion. Meeting minutes were recorded in each panel discussion. In order to further examine the study findings, we performed a brief follow up interview with two project leaders who are in charge of the pilot EMR adoption project. Several suggestions for facilitating EMR adoption were discussed in this interview and proposed in the following section.

4. Results

The most common problems identified by the respondents of the survey questionnaire are financial costs and incentives (80% of the responses), hospital information systems (HIS) and workflow change (78%), interoperability of systems and the need for standards for achieving interoperability (75%), privacy and security protection of the data (75%), and the social and organizational changes (60%) that will result from the implementation of an EMR system.

The problems listed above are consistent with those obtained from the panel discussions. In analyzing the opinions of experts, we reviewed their written opinions and meeting minutes, and with the help of the two project leaders synthesized the issues and recommendations.

The important issues that were identified in the survey and in the panel discussions are described below.

4.1 The lack of incentives for adopting EMRs

Perhaps the most difficult barrier to adoption of EMR systems is that incentives for adopting such changes are lacking under the current "global budget" payment system of the National Health Insurance (NHI) Program in Taiwan. The global budget system is essentially a fee-for-service reimbursement with declining reimbursements when thresholds have been crossed for the type of service for which claims are being made. The hospital staff expressed that the cost of EMR system adoption will increase the financial burden of the hospitals, but the financial return on the investment appears uncertain.

On the other hand, the experts pointed out that the use of EMR will bring a wide variety of potential benefits to the whole society. For example, when patients are seeking medical care at different hospitals, a patient-centered EMR will improve the continuity of care and reduce unnecessary medical expenditures. Such systems also can be very beneficial in the timely detection and control of disease outbreaks. Therefore, the experts emphasized that the government should be more proactive to develop incentives supporting the adoption of EMR systems.

4.2 The need for systems interoperability

A further barrier relates to system interoperability and adoption of standards for data interchange. Given the lack of standards among EMR vendors and hospitals in the past, systems, either homegrown or from different vendors, often cannot communicate directly with each other in Taiwan [6].

Some experts indicated that the progress in implementing national standards in healthcare data interchange should speed up. In recent years, the DOH has worked towards setting up policies for interchange of EMR data, but healthcare providers have just begun to implement the TMT national exchange in a practical setting. The adoption of TMT standards would facilitate interoperability. However, the implementation of the standard will require additional investments to make the existing systems compatible with the standard.

From the hospital staff perspective, TMT could achieve EMR exchange and sharing EMR content among HIS [2][3], but many changes will need to be made to the systems. For example, all participating hospitals have to change their system environment, such as transferring code sets within HIS to the TMT-mandated codes, deploy software for messaging, and implement enhanced security for communicating patient data to an external network environment. Additionally, the workflows for many of the patient services will need to be redesigned.

4.3 Security and confidentiality of patient data

A key issue in EMR adoption is related to the privacy, confidentiality and security of patient information. Both, the hospital staff and the experts perceived that there is an increased risk of disclosure of confidential patient information due to medical records being in electronic form and being shared over the network with other institutions [2].

Our experts pointed that there are several ways to restrict inappropriate access to patient data, including technological methods as well as institutional or policy approaches. In terms of technological methods, the DOH has implemented a Healthcare Certification Authority (HCA) project at the national level, which will completely integrate with the government public key infrastructure and a smart card system of National Health Insurance next year [3]. The EMR exchange would occur within this secure infrastructure in order to reduce the risk of loss of confidential patient information. However, the hospital staff mentioned that hospitals still have to upgrade their systems which would add to their expenses.

In addition, most experts expressed that current laws regarding these issues relate mainly to a paper world and are inadequate for security of EMRs. While the DOH is in the process of helping create laws and making regulations for patient information security and privacy over the Internet, much remains to be done.

4.4 Social and organizational change issues

Our findings indicate that an EMR system could possibly change the traditional provider-patient relationship. Some health care providers may perceive that EMR data kept by their patient will threaten their control, autonomy, and authority [7]. Another perceived challenge comes from the distrust among physicians in concurring with other physicians regarding their patients' diagnosis and treatment plans [2].

To overcome anticipated resistance from users during the uncertainties of EMR adoption, some hospital staff and experts considered that organizational support and leadership will play a key role at managing any changes that inevitably come with EMR implementation.

These major issues identified above are consistent with findings from related studies in the US and Taiwan [2][5][7].

5. Discussion and policy implications

To overcome these barriers, our study, after a follow up interview with NHIP experts, proposed the following major policy areas and suggestions.

5.1 Incentives

Perhaps, the most important step in achieving the NHIP vision for adopting EMR systems is to establish incentives that will make it attractive for hospitals to invest in EMR. Payers and regulatory agencies will play important roles in developing incentives and encouraging healthcare organizations to improve quality and adopt new measures [7]. Since, nearly 99 percent of Taiwan's population was covered by NHI by 2007, we suggest that NHI can adopt contracting and reimbursement strategies that reward healthcare organizations that use EMR effectively. Such strategies could include for example, requiring that claims be submitted with the medical record electronically, or requiring that hospitals use EMR as a tool to improve their quality indicators. These incentives could also take the form of grants, tax credits or low-interest loans from the government or payers to healthcare organizations making investments in EMR areas that have demonstrated excellent outcomes.

Non-financial incentives could also play a role in encouraging EMR adoption. For example, under the hospital accreditation system, the DOH might give healthcare organizations special recognition if they adopt EMR systems.

5.2 Interoperability and standards

The task of making EMR systems interoperable with each other and with other systems in a hospital is complex and resource intensive [2][5]. To lower the technical hurdles and risks, we suggest readily available and shared software tools, technology transfer, and support be provided to IT staff and vendors.

Furthermore, policymakers should improve the interoperability of EMR systems by promoting the standardization of clinical terminology and communication protocols. With improved system interoperability, the cost of EMR systems implementation would decrease, allowing more hospitals and vendors to implement EMR systems.

Certification criteria for EMR systems will also need to be setup, which can refer to the US experiences in the Certification Commission for Healthcare Information Technology [8]. By creating an efficient, credible and sustainable product certification program, the EMR systems market in Taiwan will potentially grow faster and accelerate the adoption of EMRs.

5.3 Security and confidentiality

Hospitals have not participated yet in a large scale effort to share patient information. They have major concerns about the privacy and security of medical records [2]. We suggest that the NHIP office should provide more technical support to enhance the security of the IT infrastructure at hospitals.

Policymakers should investigate privacy and security concerns of patients and providers urgently and enact appropriate legislation. The experts suggested that hospitals in the interim can create their own security and confidentiality policies and programs. Among others, the experiences from the Health Insurance Portability and Accountability Act in the US may provide them a learning example.

5.4 Social and organizational change

Many social and organizational change issues which are caused by EMR adoption need further exploration [2]. In addition, the changing role of the traditional provider-patient relationship should be addressed [7]. Furthermore education and research for different stakeholders may be required while users are moving toward the widespread use of EMR [7].

6. Limitations

The findings and recommendations from this study should be interpreted in light of its limitations. First, the respondents of this study may not represent the population of interest in all participating hospitals. Second, the qualitative methods used in this study may yield less precision than quantitative methods, although collecting quantitative data from all the participants covered in our study would be very difficult. As more adopters join in the diffusion, additional studies to investigate the critical factors that affect EMR implementation may be necessary. Meanwhile, the legal, sociological, and economic issues identified need further investigation.

7. Conclusions

We identified several important issues to adoption of interoperable EMR systems in Taiwan. These include “incentives for the clinicians”, “interoperability of systems”, “security and confidentiality of patient information”, and “social and organizational change caused by EMR”. Several suggestions were proposed to the government and stakeholders based on these critical factors identified and experiences of other countries. With an understanding of these critical factors, we can develop enabling policies to breakdown the barriers. Although EMR adoption in Taiwan remains in its infancy, we believe that the recent development of NHIP could facilitate faster progress in these policy domains.

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