Reducing High-Technological Medical Re-Examination Rate by NHI IC Card System

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摘要

從最近的健保統計資料發現高科技醫療費用仍不斷地上昇，且重複檢驗浪費的情形也是相當嚴重。因此本研究目的在於以健保 IC 卡建構監控機制，協助降低高科技醫療的重複檢驗率。以電腦斷層造影(CT)為例，經模擬方式進行院所間資訊共享後，重複執行率可降低 5.54%，而磁振造影(MRI)方面，重複執行率的部份也可降低 3.2%，估計二項重複檢驗的費用一年將可節省醫療費用金額約為 321,420,000 元。本研究使用分散式技術 Web Services 來實作整個監控機制的功能。研究效益包括三方面，(1)對病患而言，排隊、等待報告時間及接受多次放射線照射的風險可以減少。(2)對醫療院所及醫師而言，線上的提醒功能及資訊共享機制，醫師能充分掌握病況資訊。(3)健保局透過管理監控機制，能即時得到高科技醫療服務的使用情形。本研究結果發現此機制將可共創民眾、醫療院所、健保局同時三贏的局面，並建議健保管理當局採用此機制且加入現存 NHI Card 作業中。

關鍵字：高科技醫療服務，Web Services，健保 IC 卡系統，重複檢驗

Abstract

Statistics show that high-tech medical re-examination rate for the same patient has been increasing, which implies higher cost for Bureau of National Health Insurance (BNHI). This study proposes to construct a surveillance mechanism using National Health Insurance (NHI) IC Card as a key component, in association with web services, for reducing high-tech medical re-examination rate. The advantages of the proposed approach are three folds. First, for patients, the waiting time for the examination results and the times of repeated radioactivity exposure would be reduced. Second, it would improve the relation between the doctor and the patient and the quality of the treatment. Third, the BNHI would instantly hold the rate of high-tech medical service. We evaluate that the re-examination rate of computed tomography (CT) would be reduced by 5.54%, and that of the magnetic resonance imaging (MRI) would also decrease by 3.2% if the proposed mechanism were adopted. The total saved medical expenditure for the two examinations could amount to NT 321,420,000 every year. Finally, feasibility analysis shows the proposed approach is feasible for the current NHI IC Card System.

Keywords:：High-tech medical service, Re-examination, Web services, National health insurance ic card

1、Introduction

The escalation of health-care expenditures has been an ever-troublesome problem for many developed countries [21]. Some scholars focused on the medical economics and researchers in the hospital industry all considered that the extension of high-tech medical instruments and the augmentation of utilization are the important factors affecting health-care spending. Of these instruments, the payment fee of CT and MRI is higher than others [1][2][21]. Payment fee was from NT$2,185 to NT$ 5,035 for CT and from NT$6,500 to NT$11,500 for MRI on current medical payment system of Taiwan [4]. In those abundant utilization conditions, some diagnostic examinations were ineffective or overused leading to sharp aggravation of health-care spending [8][19][20]. According to statistics released by the BNHI in 2006, the numbers of population services were 950 thousand for CT and 320 thousand for MRI. Medical claims were more than NT$4.3 billion for CT and NT$2.6

billion for MRI in Taiwan area. Among those claims data, the re-examination rate of CT and MRI was respectively 12.8% and 5.8%. The average rate re-examination was about 10 percent during 90 days[1] in 2004 [6]. CT and MRI has become a subtle weapon in the diagnostic department. Therefore, they were regarded as a milk cow by many hospitals [2].

Many medical economists and medical policy researchers all were absolutely certain that hospital market was different from business market. Their particularity includes uncertainty, interference by insurance policy, asymmetry of information and payment system of third-party and so on. Those characters maybe result not only in market failure but also non-price competing conduct among hospitals [9][10][12][17][18]. Some research in the past found hospitals had more incentives to purchase expensive high-tech equipments to increase their competitive advantages when health-care market was highly competitive. Those conducts will lead to medical arms race [18][21][22][23]. In addition, uncertainty and asymmetry of information would also magnify health-care spending. According to the research of Gaynor & Vogt [16], there were two kinds of asymmetry of information in hospital market. One was between patients and health-care providers; the other was between health-card provides and BNHI. The health-care provider of the former would induce patient to use high-tech equipments with medically specialized advantages. The health-care provider of the latter would easily get financial benefits when BNHI lack equal information to verify the adequacy of medical treatment. In the competed situation, hospitals or health-care providers attempt to quickly pay back their high-tech equipment investments. They may have supplier-induced demand, use asymmetry of information conducts to attain the goals. However, those tricks could directly lead to the re-examination soaring and indirectly the waste of the precious medical resource. Many researches all confirm the phenomenon existence in medical industry [13][14][17][18].

[1] 90 days was round-table result of BNHI and Taiwan Medical Association.

According to the statistical report from medical analysis server, also called Data warehouse, of BNHI, from 2005Q1 to 2006Q3, the rate re-examination of CT was 12.38% at the same hospital and 17.92% at the different hospitals during 90 days[2], However, the re-examination rate of MRI was 9.20% at the same hospital and 12.40% at the different hospitals during 90 days[3][3]. Those results show that the growth rate of CT and MRI was respectively 3.66% and 46.1% from 2004 to 2006Q3, meaning that the growth rate of CT and MRI were gradually increasing and the growth rate of MRI was more sharply burgeoning than CT.

The BNHI faced the immense stress that the rate of re-examination was gradually increasing and the gap of the health insurance finance had widened, forcing them to figure out the best medical policy. The BNHI proposes and executes many medical policies to control the growth of high-tech medical re-examination rate beginning 2000.

Those medical programs includes major medical order instant system, in 2000[2]; medical payment analysis system, in 2001 [3]; special inspection resources sharing plan, in 2004 [4]; IC card system logged major medical order item, in 2005 [5]; major order no pay medical indictors, in 2006[3]; NHI IC card login and data uploading quality program in 2006 and 2007[5]. The effectiveness and efficiency of those medial policies were great to be depreciated because the hospital would use those tricks that the above mention to gain their goals. The BNHI in 2005 launched advanced information technology to implementing NHI IC Card plan to control the growth of high-tech medical services. However, current NHI IC Card system has management information

[2] CT re-examination was again performed CT or MRI after completed CT during 90 days.

[3] MRI re-examination was again performed CT or MRI after completed MRI during 90 days.

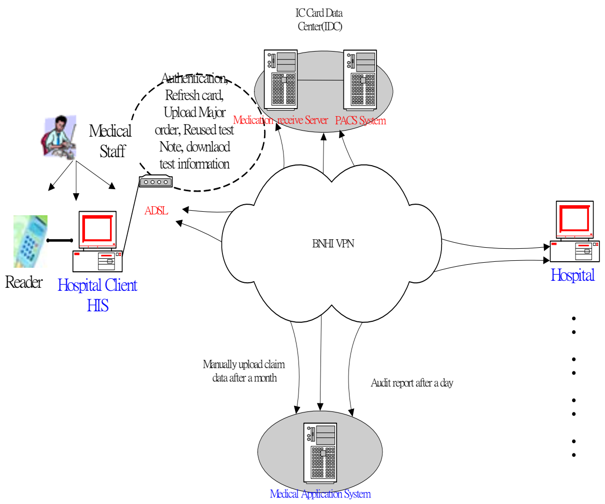

Figure1 System architecture with surveillance mechanism

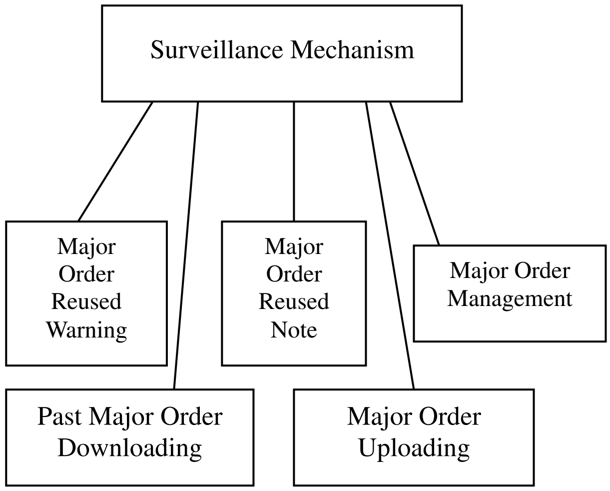

Figure2 requirements of the surveillance mechanism

lag, vicious data quality problems for BNHI [5][7]. Also, no computer interface could be used to share the diagnostic imaging among hospitals using NHIIC card. Therefore, the purpose of this paper is to construct some surveillance mechanisms using NHI IC Card as a key component reducing high-tech medical re-examination rate.

2、Material and Methods

2.1、System Architecture

This study uses the Web Services and SOAP (Simple Object Access Protocol) technology to implement the mechanism with NHI IC Card and designed system structure could be as Figure1. The NHI IC Card System architecture concerned three units that were BNHI, IDC (IC card Data Center) and about 18,000 medical institutions in Taiwan. These units were connected with the NHI VPN (Virtual Private Network). Also, between the data transfer of BNHI and medical institutions were to be completed by control software that BNHI release [15]. However, the maximum problem was that treatment data of all patients haven't been automatically and instantly transferred to IDC. The BNHI rules that all treatment data of the hospital was just transmitted within 24 hours of completion. Hence, We proposed a mechanism, adding to control software, to boost effectiveness of NHI IC Card plan. Those mechanisms contain to provide real-time management information of re-examination to BNHI, to on-line warn the physicians that the patient was may have undergone re-examination recently, and to shares the diagnostic imaging among the different hospitals. Just needing to refine the control software, The BNHI could reduce high-tech medical re-examination rate.

2.2、The requirements of the surveillance mechanism

For our research goals, the mechanism requires the following functions as figure 2.

1. Warning of major medical orders[4] of re-examination: The mechanism presents a warning message for physicians, when patients have undergone the same examination within 90days.

2.Note of major medical orders of re-examination: The physicians must explain the reasons why the patients need re-examination within 90days.

3. Uploading of major medical orders of re-examination: The mechanism uploads the major medical orders instead of hospitals manually to upload.

4. Downloading of past major medical orders of imaging: Physicians could download the imaging instead of re-examination if the imaging could use.

5. Management of major medical orders of re-examination: The mechanism would provide management information reports about high-tech

[4] Major medical order means CT or MRI high-tech examination.

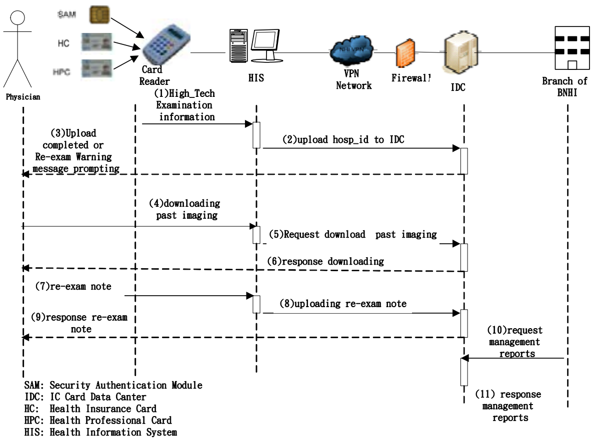

Figure3 System flow analysis diagrams

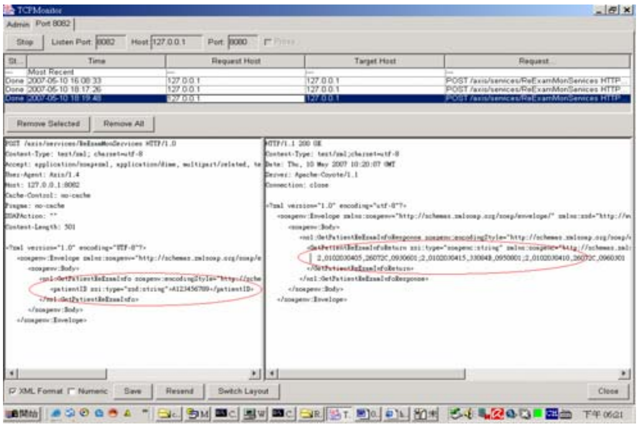

Figure 4 SOAP message from Axis TCP/IP Monitor

re-examination to BNHI.

2.3 System Flow Analysis

For our research goals, we designed the following system flow.

Step 1: Major medical order must be written into the health information system (HIS) and the IC card of the patient [11], when patients hold the IC Card to accept the high-tech examination.

Step2: Control software of health information system uploads the major medical order of the patient to IDC.

Step3: IDC verify and reply whether the patient had re-examination within 90 days. If the patient had re-examination, the mechanism would generate warning message.

Step4, 5,6: Physicians could request downloading the major medical orders of imaging from IDC.

Step 7,8,9: If the physicians consider that the patient still need to undergone re-examination, then he or she must

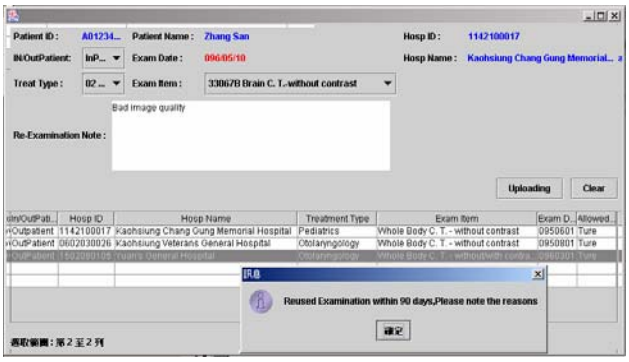

Figure5 Testing result

explain the reason of re-examination.

Step 10,11: BNHI would use the information to realize the utilization status of high-tech medical service and to control the growth rate of re-examination.

3、Results

Because the IDC has earned BSI (British Standard Institution) BS7799 security certification, and it is an important online operation environment, this study uses the Web Services and SOAP technology to implement and simulate the mechanism with NHI IC Card. Figure4 shows the SOAP message retrieved by a tool named Apache Axis TCP/IP Monitor. Fighre5 shows the interface between the user and the mechanism. Physicians would see the warning message if the patient already executed the major medical order within 90 days. The physician could select to download the previous examination image files, which use PACS (Picture Archiving and Communication Systems) interface of NHI providing with DICOM (Digital Imaging and Communications in Medicine) format stored in IDC, and make a decision as to whether the past imaging of the patient could help the treatment. The physician could consider the quality of imaging defective or the angle of imaging delivered from other hospitals in dispute. Whatever the consideration, the physician must note the reason with the mechanism. Figure6 shows that BNHI could retrieve the information of high-tech re-examination, and the information could help realize the reasons of high-tech re-examination and control the growth rate of re-examination.

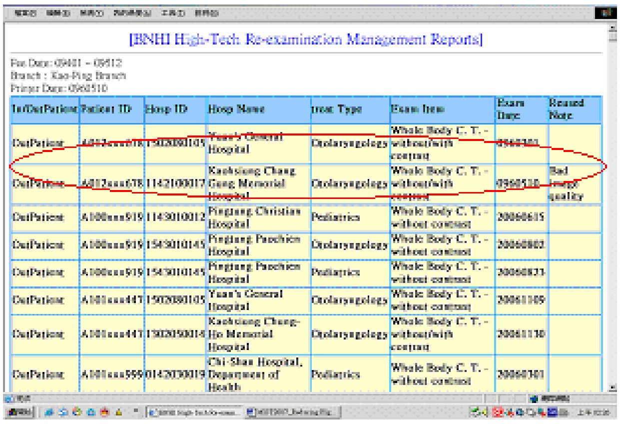

Figure6 Management report For BNHI

4、Discussion and Conclusion

It is no doubt that high-tech medical re-examination is a kind of medical waste. It is commonly believed that the number of diagnostic imaging performed is more than those actually needed for medical purpose [8]. Some examinations are really unnecessary or ineffective [19][20]. Therefore, moderate control and management is necessary. We propose a mechanism to refine current NHI IC card functions. The refined NHI IC card system not only provides for the privacy and protection of patient information but can also provide real-time management information of re-examination to BNHI, and to warn the physicians on-line that the patient may have undergone re-examination recently, and to share the diagnostic imaging among different hospitals. We believe that medical information transparency, publicity, moderate control and sharing mechanism is the one of the best approaches to confront the waste in medial finance. From Table1, We evaluate that the re-examination rate of CT would be reduced by 5.54%, and that of MRI would also decrease by 3.2% if the proposed mechanism were adopted. The total medical expenditure for the two examinations could save NT$ 321,420,000 every year. Finally, we suggest BNHI to adopt the proposed mechanism and to elaborately consider the security problem during the evaluation. From many research papers and practice operations still suggest that the IC Card should be a great material carrier on security. It could elaborately tackle the security problems of certification, integrity and authority among the

Table1 CT and MRI reused odds rate

Item	2005Q1-2006Q3		Odds Rate	Total amount
	Same hospital	Different hospital		
CT reused	17.92%	12.38%	5.54%	NT$238,220,000[5]
MRI reused	12.40%	9.2%	3.2%	NT$83,200,000[6]

(Data Source: [3]) unit: dollars

cardholder, physician and BNHI. We ponder the study from national medical policy strategy aspect. With the NHI IC Cards being widely used and there is a powerful network infrastructure, Taiwan has the position to reduce the sharply growing high-tech re-examination rate when many advanced countries still couldn't solve the problem.

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