

# THE ROLE OF INFORMATION TECHNOLOGY IN HEALTHCARE COST CONTAINMENT

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## ABSTRACT

*There is currently global concern over rising healthcare costs which has come at a time when many countries are beginning to see the tangible benefits of implementing information technology (IT) in healthcare. By having the right IT infrastructure, health facilities can achieve substantial cost savings by cutting down on hassles and wastage through timely availability of information. This paper examines the areas in healthcare in which information technology has been demonstrated to have effectively contributed to cost savings.*

*Keywords: cost containment, information technology, healthcare costs*

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## INTRODUCTION

Rising healthcare costs are a global phenomenon. In the US, national healthcare expenditure currently accounts for about 15% of its gross domestic product (GDP) which, some analysts estimate, amounts to about \$2 billion a day and expecting to reach \$1.6 trillion a year by the year 2000<sup>(1)</sup>. In recent years, concerns have also been voiced in Singapore over escalating healthcare costs although national health expenditure as a percentage of GDP is still low compared with the US and Europe. In 1990, national healthcare expenditure in Singapore only accounted for 3.1% of GDP<sup>(2)</sup>.

The high cost of medical care is a multifactorial problem and it would be naive to think that simple solutions can be found. Some factors that have frequently been cited include inflation, changing lifestyles, increased medical specialisation and the proliferation of high-tech medicine. For example, US statistics for 1991 showed that some 19 billion tests were done on Americans, earning for them the dubious distinction of being the most analysed creature on planet earth<sup>(3)</sup>. These tests accounted for well over 20% of the US healthcare bill.

Over the years, health administrators and professionals have experimented with a number of cost-saving programmes to curtail spiralling healthcare costs but recently interests have been renewed on the use of IT to help cut costs. The term 'renewed' is used because the idea of applying IT to improve work productivity and cut wastage in the health and medical disciplines is not new. In the early 1970s, computers were touted as a possible panacea for combatting rising healthcare costs but they failed to deliver mainly because of hardware costs and problems of reliability. Two decades have passed and, as everybody knows, computer hardware and software technology have made great strides since then. As cheaper, smaller and more powerful machines became more readily available in recent years and as the software to drive these machines became more sophisticated, there has been a renaissance of interests among health professionals and administrators to examine ways in which the use of information technology can contribute to the curbing of healthcare costs.

## ROLES OF INFORMATION TECHNOLOGY

In this paper, the premise that "productivity gains and wastage cuts lead to cost-savings" is assumed. The areas in healthcare in which information technology can effectively contribute to cost-savings fall into three broad categories:

- (a) Administrative Data Processing
- (b) Clinical Data Processing
- (c) Health and Medical Information Systems

### Administrative data processing

The effectiveness of IT in helping to reduce administrative overheads was one of the earliest arguments for the development of hospital information systems. The proliferation of Hospital Information Systems (HIS) in Japan in the early 70's was largely due to the need to automate hospital administration, particularly to process reimbursement of medical care costs from the national health insurance system<sup>(4)</sup>. Today, the state-of-the-art for claims processing is to automate the process by using electronic claim submission (ECS) technologies running on wide-area electronic data interchange (EDI)<sup>(5)</sup>. Due to its small size and good telecommunications infrastructure, Singapore is one of the few countries in the world that has implemented a nation-wide system called Medinet for processing Medisave claims<sup>(6)</sup>. In the US, a Workgroup for Electronic Data Interchange (WEDI) involving about 15 national health leaders and about 50 technical experts are working towards a set of healthcare data format and communications standards that will, hopefully, reduce administrative costs while improving the quality of health services. One of the major problems that WEDI will face is to convince all the health providers in the US to adopt a single standard for electronic claims payment<sup>(5,7)</sup>.

Inventory control is another major area in which IT has been proven to be an effective tool in reducing administrative costs. A study by the Health Industry Business Communications Council in the US has found that the use of EDI can reduce costs for processing a single purchase order from as high as US\$70 down to US\$14<sup>(8)</sup>. Since an average hospital processes about 15,000 purchase orders annually, the report estimated that the use of EDI could potentially save an average hospital about US\$840,000 per year. In one case study, the implementation of an electronic inventory management system in Highland Park Hospital in Illinois has drastically cut its \$260,000 warehouse inventory costs by some 70% by making use of "just-in-time" inventory management<sup>(1)</sup>. As an indication of how the health industry attaches the importance of EDI to on-line, real-time networked transactions, SmithKline Beecham, one of the world's largest pharmaceutical companies, has commissioned the

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installation of a US\$12 million international voice and data communication system to coordinate its integrated business solutions in the US and worldwide<sup>(9)</sup>.

### **Clinical data processing**

It would not be incorrect to say that most hospitals with 100 beds or larger in industrialised and newly-industrialised countries have computer installations. It would also not be incorrect to further note that most of these hospitals with computer systems make use of them purely for administrative and financial management rather than for clinical data processing.

Patient monitoring is one area in which the use of clinical data processing can substantially reduce a hospital's operational costs. Often patients have to be monitored continuously (eg ECG monitoring) or periodically (eg monitoring of vital signs). These monitoring processes may be done for diagnostic purposes eg in the emergency room; for therapeutic purposes eg in the operating theatre; or for surveillance purposes eg in the ICU<sup>(10)</sup>. As a result of the monitoring process, large volumes of data are often generated. By automating the monitoring process, manpower costs can be saved as more nursing time can be freed from recording observations for patient care activities. One hospital that has a proven track record for improving healthcare by collecting data on patients, analysing them and providing feedback to physicians on medical strategies is the Latter Day Saints (LDS) Hospital in Salt Lake City, Utah, USA<sup>(11)</sup>. The LDS Hospital, for example, has an automated patient information system that can detect adverse drug events 60 times better than the physicians. The savings to the Hospital has yet to be established<sup>(1)</sup>.

At St Joseph's Hospital in Milwaukee, USA, the use of touch-screen systems mounted in the wards has saved the hospital nursing staff an average of four hours per night shift. Translated into dollar value, this is a savings of US\$1.2 million per annum for the hospital<sup>(1)</sup>.

### **Health and medical information systems**

These are systems that can collect, collate and present data from various sources to the user in very quick time to meet his/her information needs. The use of these systems saves the user time to look for various items of information and to combine them in a comprehensible manner. Time saved this way is freed for patient care or for other useful activities.

We take the use of an expert system to illustrate how the use of a medical information can help reduce healthcare costs. One of the main reasons cited for spiralling healthcare costs is that physicians tend to prescribe medical tests too readily. Don Lester, in his study on "Quality care on a budget: realising benefits from clinical systems", maintained that second medical opinion could be one of the ways of lowering costs<sup>(12)</sup>. From the IT angle, an approach to "second medical opinion" could come from the use of expert systems. An expert system is a software that mimics the way a medical expert will examine, diagnose and recommend treatment for a patient. A case-based expert system goes further by reviewing its database of case histories of patients with signs and symptoms that are similar to the current case and advise the physician on treatment strategies based on the information stored in its knowledge base. Hence an expert system could be used as a cross-checking tool to advise the physician whether or not an expensive medical test should be prescribed given the patient's history and signs and symptoms.

The US Congress is considering legislation that will help implement the use of computer-based patient records throughout the country<sup>(13)</sup>. This move is based on a 1991 Institute of Medicine report which found that healthcare in the US "can be more

efficient and effective if patient record information can be easily accessed and analysed". Computer modelling studies by the management consulting firm Arthur D Little Inc show that electronic management and transport of patient information will very substantially decrease healthcare costs by replacing bulky, time-consuming and often inaccurate paper records and telephone retrievals with real-time, on-line networked transactions<sup>(1)</sup>.

Much interests have been shown recently in the use of video conferencing. This facility has enabled physicians at one facility to review a patient and discuss the patient's diagnosis and treatment with their colleagues at another, often a remote, facility using a two-way interactive system. In principle, the use of video conferencing should financially benefit the remote facility as the patient remains at the local hospital for treatment and the hospital can tap the services of experts who are unable to be physically present at the remote facility for one reason or another. Moreover, video conferencing expenses should be cheaper than bringing in the expert. There is still some debate among medical circles as to whether video conferencing is medically viable and cost beneficial<sup>(14)</sup> but a recent study by Arthur D Little Inc estimates that the use of video-conferencing for professional training and remote medical consultations can expect to reduce healthcare costs in the US by over US\$200 million<sup>(1)</sup>.

Another application in which the use of telecommunications can potentially save healthcare costs, particularly institutional care, is home health monitoring. With institutional healthcare costs escalating worldwide, interests have been centred on the applications of IT to home monitoring of patients, particularly the chronic sick. Japan is very actively engaged in the development of home care support information systems to meet the problems of an increasingly large pool of aged sick as well as increasing healthcare costs. In one project<sup>(15)</sup>, a system which is linked to the home telephone, can measure, collect and record basic biological information such as ECG, blood pressure and body temperature of the patient with cardiovascular problems at home. The telephone is modified to hold an IC memory card and multifunctions such as simple character and picture processing functions. The collected information is sent from the patient's home to the medical facilities either by on-line or off-line mode to be stored in a database. While such systems are still prototypes, their potential contribution to reducing healthcare costs should not be readily dismissed.

The Blue Cross and Blue Shield Association, a health insurance company in the US, has been actively supporting a pilot programme in Rochester, New York for early hospital discharge followed by home nursing care. The programme reported over US\$800,000 in savings by early discharge in 1972 and today, it is estimated that more than US\$2.5 million are being saved annually. In countries where the supply of community nursing personnel is unable to meet the demands of an increasingly growing pool of home-bound chronic sick in the community, the use of IT for health monitoring could be a realistic proposition.

### **CONCLUSION**

Experts in the IT and health industries are generally of the consensus that IT alone cannot improve the quality of healthcare delivery or lower healthcare costs. However, by having the right technological infrastructure, hospitals and healthcare institutions can achieve substantial cost savings by cutting down on hassles and wastage through timely availability of information. A study by MECON Associates, a California-based consulting firm, has shown that hospital departments which have computerised their operations have better performance, both in work quality and productivity than departments which do not<sup>(16)</sup>.

While IT can be offered as one of the solutions to help reduce healthcare costs, there are several impediments to its implementation:

#### **Lack of standards**

One of the biggest problems in the implementation of IT in the healthcare industry is the lack of standards. The conversion of paper claim forms into electronic media alone can prove to be an administrative nightmare because in the US alone, there are at least 450 different claim forms using different coding conventions, formats, acronyms and jargons<sup>(17)</sup>. The same is true for the use of the electronic medical record (EMR) because currently no standard structure for EMR exists.

#### **Indiscriminate use of IT in the health industry can threaten patient safety**

In 1992, the General Accounting Office (GAO) in the US released a report criticising the Pentagon's Composite Healthcare System (CHCS) for having deficiencies that might threaten patient safety<sup>(18)</sup>. In the report, the GAO charged that the CHCS system has crucial problems such as multiple records for individual patients and the lack of an archiving capability. The multiple record problem has arisen because records from the old Department of Defence stand-alone systems in 14 medical facilities were integrated into the CHCS database without adequate linkage. As a result, doctors at any one facility could be providing care using electronic records that are incomplete because of the linkage problems. The Pentagon is now taking steps to remedy this defect.

The indiscriminate development and use of medical expert systems can also potentially threaten patient safety. If the knowledge base of an expert system or its reasoning processes are not adequately validated, the advice given by the system can be medically flawed, thereby providing treatment that is unnecessary and even possibly endangering the patient's health.

#### **Use of IT in health: Easy to say, hard to implement**

It is rather unfortunate that countries which are beginning to see the tangible benefits of implementing IT in healthcare are also grappling with the issue of rising healthcare costs. The upshot of this is that mixing the two can have a stifling effect on the development of informatics in healthcare. When considering the implementation of IT, health planners and administrators must not fall into two traps:

- (i) equating information systems with high-tech medicine. Indeed, as in the example of using an expert system to screen for patients before they are prescribed any high-tech investigations, the use of information technology can serve as a sentinel to prevent any possible overuse and, often, misuse of expensive medical tests.

- (ii) information technology is expensive and will add to healthcare costs. Whilst it is true that IT implementation, especially institution-wide, is not cheap, healthcare administrators and planners should take a long-term view rather than a short-sighted, short-term view because the benefits will not be immediately tangible but will only be apparent two to three years post implementation. Health administrators must never find themselves in a "Catch-22" situation by expecting more information from the hospital while not adequately supporting the development of systems by which such information can be opportunistically captured, stored and retrieved.

Finally, having the technology is a different issue from implementing the technology productively. There is a case of one major urban hospital in the US which assigns a new identification number to the same patient each time he visits the hospital. Not only is the hospital information system wasting its resources but it also creates problems for its electronic medical record system as after several visits to the same hospital, each patient will have built up for himself multiple, unlinked records which would make the use of the EMR system worthless for his clinical management<sup>(1)</sup>.

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