



BADM 590 MS-1

Trustworthy Computing:

Information Security and Management

Professor Mike Shaw

Building an e-Healthcare

Submitted by Yen-Yi Ho

Overview

As the internet rising and developing, every industry wants to make money by setting the website through the internet. But e-business in Health Care Industry is not easy to set up because this industry is too complicated, specific and professional. All is about the life not a product. Now, something is changing. E-business will redefine the delivery, administration and management of health care during the next five years. Building an e-health care is not a dream. It can be put into practice in the future.

Nowadays, the patient can look online with his symptoms and figure out what he has. He still needs to go to his doctor to get the prescription or orders the prescription online and then goes pick it up in hospital. This process is still inconvenient. Can we see the doctor online and get the prescription by printing it out? All the diagnosis process is online. This idea has been practiced by General Motor (GM) and Medscape. It launched in 2001 only for the employees in two isolated cities of GM.

The project will concentrate on the three parts. One is policy issue- HIPAA; another is the infrastructures; the other is administration. In the first part, e-healthcare work in hospitals and clinics must be related by HIPAA- the privacy of personal health information and electronic information transmission. What are the infrastructures and the applications used for e-business will mention detail.

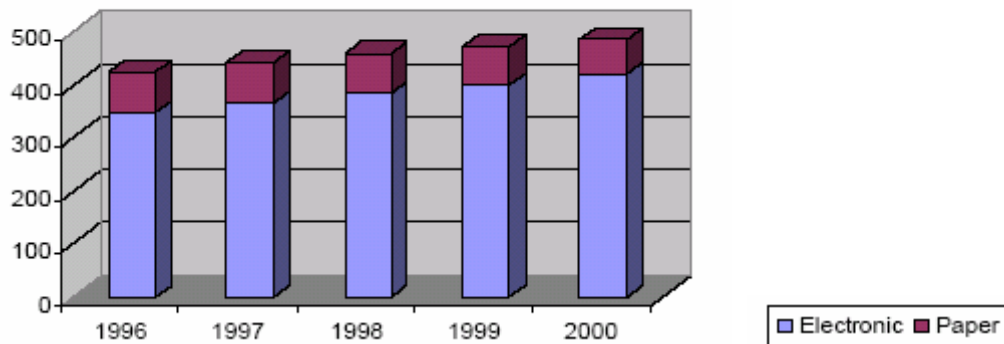
Background

- **Health Care Industry**

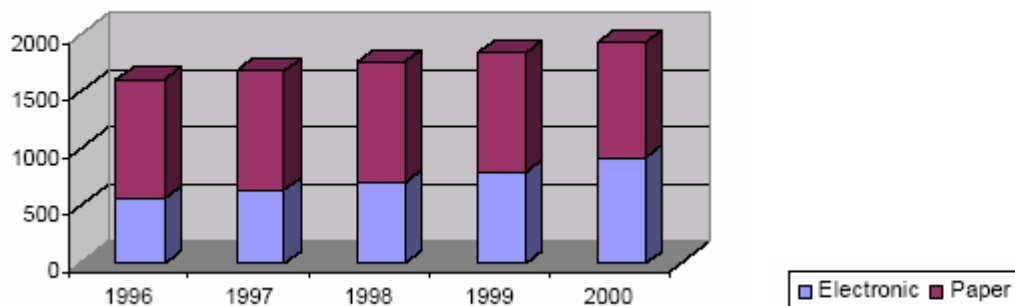
In 2004, Health care is the largest industry in the US with annual spending of more than \$1.9 trillion, representing approximately 16 percent of the gross domestic product (GDP). Total national health expenditures raised 7.9 percent. U.S. health care spending is expected to increase at similar levels for the next decade reaching \$4 trillion in 2015, or 20 percent of GDP.

The problems of health care system in US are inefficiencies, excessive administrative expenses, inflated prices, poor management, and inappropriate care, waste and fraud. These problems significantly increase the cost of medical care. Most of these are due to that health care is still a paperbound and fragmented industry. “Industry observers and health-care executives believe that e-business can be a significant part of the solution. E-commerce/e-health initiatives were ranked as the No. 1 priority during the next 12 to 18 months for health”. The bar chart as follows shows that from 1996 to 2000 in hospital and physician claims, the use of electronic claims will escalate and replace paper claim. Most the document in hospitals or clinics will be storage and transmitted by the electronic form in the next few years.

Hospital Claims (millions)



Physician Claims (millions)



Source: © 2006 Protiviti Inc

The benefit of electronic forms and electronic medical record is saving a lot of space to storage them and efficiently and effectively transmitted between the departments, laboratories, hospitals or insurance companies. The disadvantage of e-document is easy to be used illegally by a hacker and the privacy will be disclosed easily.

E-business is not safe anymore. Therefore, the US government legislates- HIPAA for the coming e-business era in healthcare industry.

● **E-business**

The term "e-business" was coined by Lou Gerstner, CEO of IBM. E-business means "Electronic business" and is defined broadly as any business process that relies on an automated information system. Today, this is mostly done with Web-based technologies. Electronic business methods enable companies to link their internal and external data processing systems more efficiently and flexibly, to work more closely with suppliers and partners, and to better satisfy the needs and expectations of their customers. E-business is more than just e-commerce and i-business (Internet-business). It involves business processes spanning the entire value chain: electronic purchasing and supply chain management, processing orders electronically, handling customer service, and cooperating with business partners. E-business can be conducted using the Web, the Internet, intranets, extranets, or some combination of these.

● **E-healthcare**

E-healthcare is defined as the application of Internet and other related technologies in the healthcare industry to improve the access, efficiency, effectiveness, and quality of clinical and business processes utilized by healthcare organizations, practitioners, patients, and consumers in an effort to improve the health status of patients.

E-health includes many dimensions:

- Delivery of key information to healthcare partners
- Provision of health information delivery services
- Facilitation of interaction between providers and patients
- Facilitation of the integration of healthcare industry-related business processes
- Both local and remote access to healthcare information
- Support for employers and employees, payers and providers

Within this framework, the overarching goal is to improve the Patients' health.

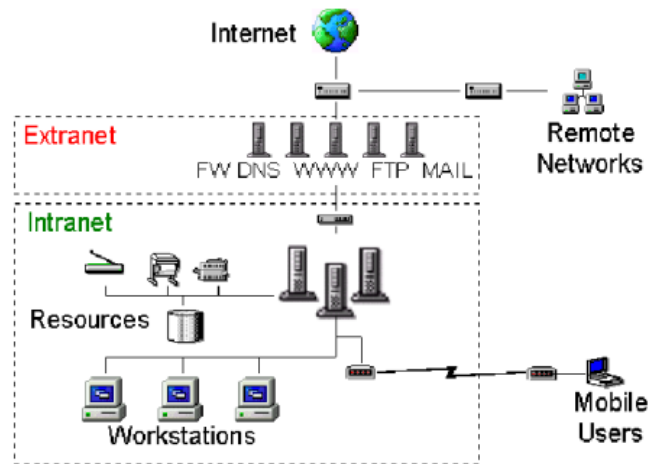
Some boundaries in e-healthcare

E-healthcare is the one division of the hospitals or applies to the clinic. It does not replace existing infrastructure applications. Instead, it facilitates those processes to expedite delivery and improve the quality of the services provided both locally and remotely. The benefits are that there are no geographic boundaries in e-healthcare world, the patient does not need to book appointments, wait for the medical treatment or ask for leave from the job because of having an appointment with doctor. It will also provide the cheaper diagnostic fee, convenient time and comfortable services for the patient. Anyway, it will overthrow the traditional health care industry. Besides, E-healthcare is not another name for e-commerce in the healthcare industry. It is the facilitation of business processes among employers, employees, insurers, suppliers, clinicians, patients, administrators.

How does e-healthcare work? The medical process is almost the same the physician can diagnosis by webcam, give the better suggestion about the next-step treatment and give the prescription. All the process is on-line and health information like electronic health record (HER) need to be standardized to easy transmission. Many e-healthcare system architectures will be set up that can work the whole e-healthcare system

E-healthcare system architecture

The infrastructure that supports e-health includes seven dimensions- internet, extranet, intranet, core data system, telecommunication and hardware. It provides the environment for E-healthcare. There are three terms- internet, extranet and intranet have to be defined. As the following drawing, internet is the publicly accessible worldwide system for people who need the information; extranet is used for business partners like suppliers, vendors and so on. They share the information or the application software by a private network and Intranet is for different departments to deliver the internal and core data.



Source: http://www.study-area.org/network/network_define.htm

Other infrastructures like Core Data Systems are function-based systems that support the key processes of the enterprise. The core data system in e-healthcare is the computerized patient record (CPR), PACS, admission and appointment systems, financial patient accounting systems and the internal infrastructure systems. All the stuff mentioned above will be through the telecommunications- wireless, fiber, cable and satellite and hardware- computers, personal digital assistants (PDA's), PC tablets telephones, servers and other hardware provide the physical support for this infrastructure.

The change from e-healthcare

The new relationship in e-healthcare

The relationship in e-healthcare is totally different from the traditional way. The patient called “e-patient” will search more disease and health information online to discuss with his physician in that he wants the power to participate in the process. E-patient will use the internet to access information on injuries, prescription drugs, health insurance and child development. The information asymmetry between the physician and patient is decreasing. This relationship is closer than before.

The new potential market

The e-patient does not look for the treatment, in advance they look for keep his well. The survey shows that millions of Americans are seeking better health without the aid of a physician or healthcare provider, by accessing information about vitamins, clinical trials, alternative medicine, fitness and organic food. The self-care is the largest form of healthcare in the country, bigger than hospital care, physician care or home care. Approximately 80 percent of healthcare expenditures in US are related to

consumer self-care. This is a potential market for e-healthcare provider in that internet can become the media for this alternative.

The risk from the e-healthcare

A recent study revealed that 67 percent of consumers prefer to print out information on-line and take it to their physician for discussion. They want to play the leading role in their medical process. But there is a risk for the patient and the physician. The information the patient got from the internet may be wrong, not related his symptom or easy to misunderstand. The gap between them may be huge. The patient cannot trust and follow the physician's directions. The physician has to spend more time to explain the diagnosis, treatment and direction and correct the information the patient got from the internet. Therefore, communication is very important in the e-healthcare.

HIPAA

Building an e-healthcare means all the treatment process will be via on the internet and the document will be electronic medical records. Everything needs to be standardized for easy to convey by the internet. That is why we need health insurance portability and accountability act (HIPAA). HIPAA was signed into law on August 12, 1996 and applies to health care providers. HIPAA legislation will drive the health care industry toward much needed standardization and e-business. So, following HIPAA is very important in that the provisions of HIPAA is established transaction, security and privacy, standards and regulations for the electronic exchange and management of certain health-care information.

There are some provisions used or relevant in this project- building an e-business. They are about general principle for users and disclosures and HIPAA security standard.

General Principle for Uses and Disclosures

When using or disclosing an individual's protect health information, it should be have a covered entity to protect personal privacy. There are two exceptions. One is who gets the permission or authority; the other is when Health and Human Service (HHS) undertakes a compliance investigation or review or enforcement action.

HIPAA Security Standard

The mention as fellows is to make sure the data will be managed, stored and secured well avoid disclosing the protected health information.

HIPAA security is composed of four categories of security

(a) Administrative Procedures

It addresses an organization's need for formalized documented practices. It applies to the implementation and execution of security measures that protect data and the behaviors of personnel in regard to data protection.

(b) Physical Safeguards

It makes sure that physical computer systems, related buildings and equipment will be protected from fire and other natural and environmental hazards.

(c) Technical Security Safeguards

It will meet the needs of access control, audit control, authorization control, data authentication and entity authentication.

(d) Technical Security Mechanisms

It prevents unauthorized access to data that is transmitted over a communications network.

Clinical Information Solutions

To convert to an e-healthcare system, there are many challenges have to face. Like the infrastructure, applications and business intelligence, all the stuff meets the e-business need. As follows are all about the clinic information to change to electronic documents. Introduced software and equipment developed by ALLSCRIPTS Inc. will give a concrete idea about the clinical information solution.

Electronic Health Record

According to the IOM report, between 44,000 and 98,000 Americans die each year as a result of medical errors, making them the 8th leading cause of death in the United States. It is estimated that medical errors result in approximately \$29 billion in excess health care expenditures and lost productivity each year. Now, The electronic health record software like-TouchWorks and TouchChart Electronic Health Record (EHR) developed by ALLSCRIPTS Inc. can provide real-time access to information among clinical care providers, hospitals, labs, pharmacies, payers, and other parties involved in the delivery and receipt of health care. The best of the software is it can provide decision-support tools for clinicians, avoiding medical and medication errors and saving more life.

Document Imaging

In the traditional medical process, all the document and medical report write on the paper. They are easy to be damaged because of the fire or other environment hazards. There are also another problem about the storage space like the cost, the

administration cost and the labor cost. Now, the equipment TouchChart Base and TouchWorks Scan document imaging and scanning solutions provide physician practices with an affordable solution to help manage document workflow and lay the foundation for a comprehensive EHR and a paperless office. A paperless office can produce immediate improvements in time savings, profitability, and staff productivity. New electronic document imaging allow physicians to access charts and medical histories of patients without having to search files or wait for chart pulls to gain access to the information, eliminating the costs associated with building and maintaining paper charts.

Electronic Prescribing

The traditional hand-writing prescription may result in errors because there is no double check system to review the prescription. Nowadays, Touch Script and TouchChart Rx+ electronic prescribing solutions provide physicians access to clinic decision support to ensure that every prescription a safe prescription. The software will check there is side effect or not to prevent the error happens.

Effective security awareness

Security awareness demands have significantly changed during the past few years due to frequent and rapidly changing threats. The threats like emails, hackers and viruses may damage the system. To protect and secure the system especially in the health care industry is very important. It involves in the patient's health information. Therefore, make sure the safety and be protected security awareness program is very important. This is not only the IT people's duty but also the government and manager's responsibilities. What IT people do is building the safety, security and trustworthy system to prevent the internal and external threats. Thus, the good policy and rule set by the government and manager can support the security awareness program perfect.



Source: Forrester Research, Inc.

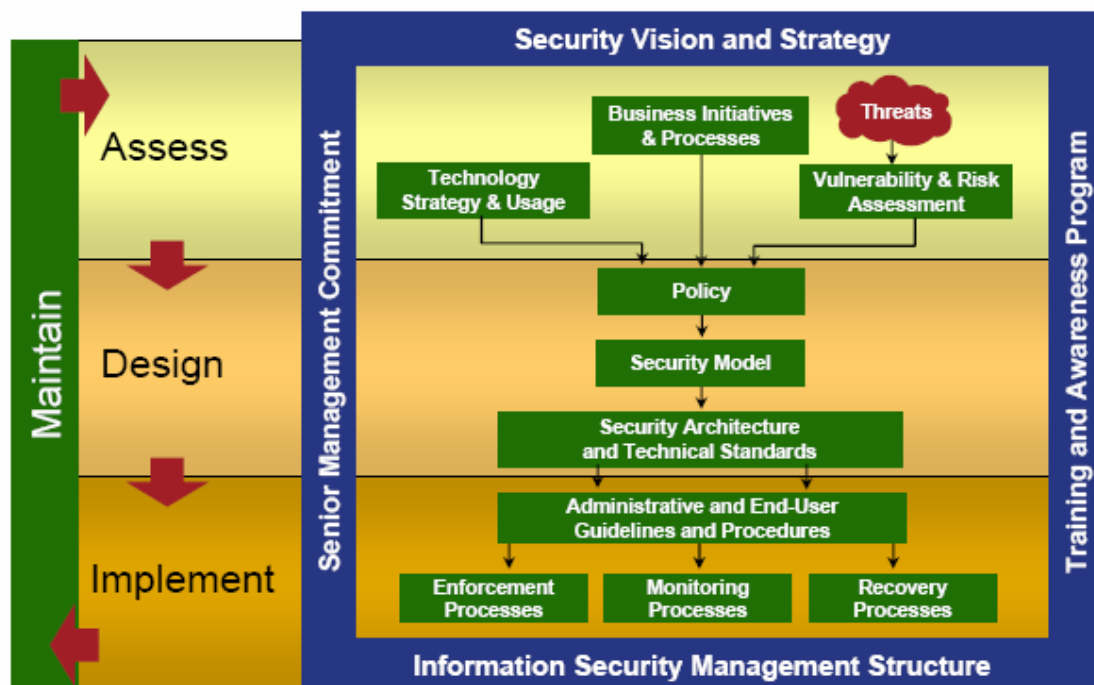
The function of IT

The IT in the hospital

1. Broad development of storage products.
2. Accelerated spending on application integration.
3. Investments in new applications.
4. Security is important.

Every organization sets the IT department to handle the technology problem.

Hardware, software and security issue the most important items in IT. In the healthcare sector, it experienced a growth spurt of IT. The structure as follow shows the detail information security management.



Source:PriceWaterhouseCoopers, Inc.

Examples and Cases (the article is on the appendix)

In 2001, GM launched the first pilot phase of its wireless health care initiative. GM and health care vendor Medscape Inc. provided physicians in Shreveport, La., and Oklahoma City. These two cities are relatively isolated but where the company has a sizable presence. The first pilot treated GM employees with a PalmVx, a printer, a prescription-writing system free of charge and digital health-record system. The treatment process is used electronic medical records that help physicians more quickly communicate with labs and obtain information regarding physician treatment. GM

expects the handheld initiative to reduce errors associated with illegible handwritten prescriptions. E-healthcare uses the same idea as the GM does, want to provide the service to everybody and just focus on specific person and be widespread in U.S.A. in the future.

Conclusions

E-healthcare will be the trend in the future. Now, this idea does not mature and just the first-stage. To promote and practice e-healthcare, the perfect policy, software, hardware and trained physicians and educated patient have to prepare very well. The implement of HIPAA is a good start to protect the health information and privacy and the patient can go to another hospitals or clinic easily by conveying the data via the internet. Besides, more and more companies have developed the software to meet the e-healthcare need like electronic health record, document imaging and electronic prescribing and so on. For the healthcare providers, the administration cost is decreasing and the process is more efficiency. For e-patients, the software systems protect their health because the systems can review and correct the medical error. They permit to know and realize their symptom, diagnosis and direction on the EHR. Everything on the e-healthcare is electronic that means more easy to get from the hacker. Therefore, improving technology about the security is the big issue in the coming e-healthcare era.

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Appendix

General Motors and Medscape Form E-Business Health Care Alliance; Partnership Provides Physicians With Technology to Improve the Quality of Patient Care

[Click here for MDLI stock quote/chart](#)

BW0441 JAN 25, 2001

10:35 PACIFIC

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(BW)(NY-MEDSCAPE/GM)(MDLI)(GM) General Motors and Medscape Form E-Business Health Care Alliance; Partnership Provides Physicians With Technology to Improve the Quality of Patient Care

Business Editors, Health/Medical Writers

DETROIT & NEW YORK--(BUSINESS WIRE)--Jan. 25, 2001--General Motors Corporation (NYSE:GM) and Medscape (Nasdaq:MDLI) announced today an e-business health care alliance that will use Medscape's computer-based technologies to facilitate improvement in the quality of patient care by reducing medical errors while lowering health care costs.

GM and Medscape will cooperate on a three-year program to encourage U.S. physicians to use hand-held computer devices for prescribing drugs and accessing digital health care records (DHR).

DHRs provide physicians up-to-the-minute medical information, including online reference material, patient records, insurance and billing data. Medscape's DHR system, Logician, is the most widely used office-based DHR application in the nation with more than 11,000 clinician users. Over 16 million patient records -- nearly 6% of all Americans -- are housed on Medscape's systems. These electronic systems reduce medical errors associated with illegible handwriting, improve patient safety by identifying drug interactions and eliminate duplication of services. It's estimated that 900 million prescriptions -- 30 percent of all orders written each year -- have to be rechecked, due to confusion over doctor's handwriting or insurance rules. One Harvard study found that prescription-drug errors decline by 55% when doctors use electronic prescribing systems.

GM will sponsor Medscape's distribution of its hand-held units to approximately 5,000 physicians who treat GM enrollees across the country. Medscape's prescription software, Medscape Mobile, offers physicians downloadable pharmaceutical reference tools for Palm OS hand-held devices and the ability to write prescriptions. The devices are capable of alerting physicians to drug -- drug interactions and can prompt doctors to consider medically equivalent, lower cost and/or generic drug alternatives. They also make it easier for physicians to comply with a health plan's formulary requirements.

"The adoption of this leading-edge technology can improve the quality of health care and supplements General Motors' numerous e-business initiatives that are directed at enhancing the lives of our employees and their families," said Kathleen S. Barclay, vice president of GM's Global Human Resources.

"Providing doctors with information at their fingertips helps our employees and retirees to receive appropriate care, for example, the right prescription drug at the right dose, whether that's at the hospital bedside or in the doctor's office," said Jim Cubbin, GM executive director, Health Care

Initiatives. "GM believes the digital health record will revolutionize the U.S. health care system, much like ATMs have revolutionized the banking industry. With the critical mass of 1.2 million GM health plan members, Medscape will have a great opportunity to implement programs and obtain data to further adapt this technology and expand it throughout the U.S. health care system."

"This is a significant alliance for Medscape, GM and the health care industry," said Mark Leavitt, MD, chairman, Medscape. "This association with GM reinforces our belief that the digital health record will play an increasingly important role in the safe and cost-efficient delivery of health care. This program will provide irrefutable evidence on reductions in medical and prescription errors as well as cost-efficiencies. This alliance will not only benefit GM and its plan members, but ultimately all of us who use health care services."

As the largest private purchaser of health care in the U.S., GM is the ideal partner for Medscape because it generates a high volume of health claims, allowing effective evaluation of the technology. This alliance helps GM address several health care challenges, such as overuse, under use and misuse of medical services, inappropriate prescription drug prescribing practices, and other quality concerns and escalating cost drivers. Data collected from the pilot program will be aggregated to not include patient names and other personal information that could identify individuals.

"Medscape has been selected by GM for this point-of-care technology project because they are one of the few suppliers of both hand-held prescribing and DHR applications," said Cubbin.

In addition to its DHR products, Medscape is well known among US physicians due to its two Internet sites. Medscape.com, its professional medical website is also the largest provider of physician continuing medical education on the Internet and CBS Healthwatch.com, is the leading physician-recommended health care website for consumers. GM will have the opportunity to provide access to CBS Healthwatch.com through its Intranet.

As part of the strategic alliance, GM will receive warrants for 5 million shares of Medscape stock. GM and Medscape will also share in the savings from prescription drug claims realized directly from physician usage of Medscape Mobile. This arrangement will serve to strengthen the strategic alignment of the two companies and solidify their business relationship. It also firmly demonstrates GM's commitment to improve the quality of health care for its plan members while reducing its health care costs. Further details of this agreement were not disclosed.

General Motors

General Motors (NYSE:GM), the world's largest vehicle manufacturer, designs, builds and markets cars and trucks worldwide. It employs about 388,000 people globally. GM is investing aggressively in high technology and e-business within its global automotive operations and through such initiatives as e-GM, GM BuyPower, OnStar and its Hughes Electronics Corp. (NYSE:GMH) subsidiary.

Medscape

Medscape(R) (Nasdaq:MDLI) is a clinical information company. It is dedicated to improving health care through the development of Internet portals and Digital Health Record (DHR) applications that provide a array of relevant and trusted health care information to individual, small group and network health care providers, the pharmaceutical industry, and consumers.

The merger of MedicaLogic, Inc. and Medscape, Inc., and MedicaLogic, Inc.'s acquisition of Total eMed, Inc., a privately held company, in May 2000 formed MedicaLogic/Medscape, Inc., d/b/a Medscape. The company employs approximately 1,000 people and is headquartered in Hillsboro,

Oregon.

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The statements in this press release regarding Medscape's prospects for continued growth, use of capital, and our plans to introduce new products are forward-looking statements based on current information and expectations. Achievement of those results is subject to a number of risks and uncertainties, including the risk that our products and services will not be accepted by physicians, patients and other healthcare stakeholders; the risk that we may not be able to introduce new products on schedule or at all; and the risk that we may not achieve favorable operating results or profitability. The reader is cautioned not to place undue reliance on forward-looking statements, which are not a guarantee of future performance. For more information concerning these and other possible risks, please refer to our Form 10-K filed on March 14, 2000, our Form 10-Q filed on Oct. 27, 2000, our Form S-4/A filed on April 4, 2000 and other filings with the Securities and Exchange Commission. These filings can be accessed over the Internet at www.sec.gov.