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## Review

### *E-Health Strategies Worldwide*

**Abstract:** Healthcare worldwide is in a state of constant change. The multitude of changes require creative solutions that range from restructuring healthcare to provide better services to the effective use of information technology (e-health). Both are daunting tasks in any individual organization let alone on a national or international level. To completely cover the many e-health initiatives worldwide would require a more comprehensive document than is possible within this article. Therefore, this article represents a sample of the e-health efforts that are occurring simultaneously throughout the world.

#### E-health Definition

There are a number of definitions of e-health. The following two definitions reflect the most prominent definitions.

- “The application of the 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 to improve the health status of patients.” (Healthcare Information and Management Systems Society (HIMSS))[1].
- E-health is health’s version of e-commerce: that is, conducting health business electronically. E-health is the combined use of electronic communication and IT in the health sector, both at the local site and at a distance for clinical, educational and administrative purposes [2].

world with such dazzling applications as surgical procedures performed by remote-controlled robotic devices, the transmission of digitized medical images and biological signals, and the use of real-time teleconsultation. Many clinical and administrative information and communication technology applications are available in healthcare organizations. Most organizations have the goal of a fully integrated information system for the benefit both individuals and their organizations.

Given what is occurring, E-Health is not only a realistic and viable concept it is also the underlying support structure for the changes that are mandated or required to support the complex health care systems in the world today. E-Health will continue to evolve driven by technology and the need of consumers (patients) for health care information and services. There will be continuous development of new and innovative techniques and the consumers’ (patients’) needs will only increase the need to access to healthcare information and services.

During the last 12 plus years the explosive growth of the worldwide Internet has exceeded the expectations and imagination of the technology industry [3]. The expansion of com-

puter and telecommunications technology across all economic sectors was fueled by the ease of communication, transactions and information gathering through this new medium. Consumers were intrigued by the ability to gather information from a variety of sources and to make purchases quickly using a variety of shopping tools. Entry into this new world to establish a web site could be achieved by acquiring a domain name and a webpage, at a nominal cost. From chat groups to individual web pages, the sharing of health information also grew rapidly, and often without quality controls [4].

During this same period, many health care organizations increased their investment in the technical infrastructure for healthcare was increased to meet the new challenges of managed care and financial pressures. Clinicians who had used computers in their academic training demanded the same ease of access to on-line reference materials. As new tools, such as radiology Picture Archive Communications Systems (PACS), laboratory and electronic medical record systems were introduced, physicians expected to have current information available at their fingertips wherever they were – at home, in the office, at the hospital.

#### Introduction

Over the past few years, telecommunications-mediated health interventions have made headlines around the

The competing demands for instant access to information and transactions as well as the increased availability of technical equipment supported rapid growth of the information delivered through various web services. Just about every company connected with health care saw the benefit of using technology to fill the demand for immediate healthcare information.

There is an unfortunate issue in this new direction and that is that some companies are adding “e-” to old solutions. Many new initiatives remain unproven. It will take time to know which solutions will be successful. Strategic goals and needs must be the focus of our e-health systems and not the vendors or suppliers’ business models.

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### What is the “E” in E-Health? [5]

According to Gunther Eysenbach, the “e” in e-health does not only stand for “electronic,” but implies a number of other “e’s,” which together perhaps best characterize what e-health is all about (or what it *should* be)..

1. **Efficiency** - one of the promises of e-health is to increase efficiency in health care, thereby decreasing costs. One possible way of decreasing costs would be by avoiding duplicative or unnecessary diagnostic or therapeutic interventions, through enhanced communication possibilities between health care establishments, and through patient involvement.
2. **Enhancing quality** of care - increasing efficiency involves not only reducing costs, but at the same time improving quality. E-health may enhance the quality of health care for example by allowing comparisons between different providers, involving consumers as additional power for quality assurance, and directing patient streams to the best quality providers.
3. **Evidence based** - e-health interventions should be evidence-based in a sense that their effectiveness and efficiency should not be assumed but proven by rigorous scientific evaluation. Much work still has to be done in this area.
4. **Empowerment** of consumers and patients - by making the knowledge bases of medicine and personal electronic records accessible to consumers over the Internet, e-health opens new avenues for patient-centered medicine, and enables evidence-based patient choice.
5. **Encouragement** of a new relationship between the patient and health professional, towards a true partnership, where decisions are made in a shared manner.
6. **Education** of physicians through online sources (continuing medical education) and consumers (health education, tailored preventive information for consumers)
7. **Enabling** information exchange and communication in a standardized way between health care establishments.
8. **Extending** the scope of health care beyond its conventional boundaries. This is meant in both a geographical sense as well as in a conceptual sense. E-health enables consumers to easily obtain health services online from global providers. These services can range from simple advice to more complex interventions or products such as pharmaceuticals.
9. **Ethics** - e-health involves new forms of patient-physician interaction and poses new challenges and threats to ethical issues such as online professional practice, informed consent, privacy and equity issues.
10. **Equity** - to make health care more equitable is one of the promises of e-health, but at the same time there is a considerable threat that e-

health may deepen the gap between the “haves” and “have-nots”. People, who do not have the money, skills, and access to computers and networks, cannot use computers effectively. As a result, these patient populations (which would actually benefit the most from health information) are those who are the least likely to benefit from advances in information technology, unless political measures ensure equitable access for all. The digital divide currently runs between rural vs. urban populations, rich vs. poor, young vs. old, male vs. female people, and between neglected/rare vs. common diseases.

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### E-Health World Review

In order to better understand the e-health initiatives that are taking place worldwide, we surveyed a number of International Medical Informatics Association members. We are grateful for those that responded and they are future recognized in the Acknowledgement section of this article.

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### The Asia-Pacific Area

#### Australia

The NSW Department of Health will begin prototyping its new electronic health records project this month in what is believed to be the first, wide-scale online patient information database of its type in Australia. Dubbed “Healthlink”, the project has received \$19.4 million in funding for five years and started “well before” the national HealthConnect project came into being, according to assistant director of electronic records strategy for information business solutions at NSW Health Joanna Kelly. “Healthlink was born out of a review of health in NSW where a major recommendation was

that NSW move towards electronic health records which dovetails well into the national network,” Kelly told Computerworld. “We’re literally days away from developing and prototyping the electronic health records system which will go live in September. The prototyping will be finished by the end of the year.” Healthlink’s first implementation will involve GPs and private clinics, and then be extended to include other services like pharmacies, and eventually be available to all clinicians, not just GPs, because present health information is “fragmented across many segments” [6].

The Distributed Systems Technology Centre (DSTC) has signed a \$2.9m contract with the federal Department of Health and Ageing to develop software for Australia’s planned system of shared electronic health records, HealthConnect. The project, carried out in partnership with the General Practice Computing Group and Queensland Health, marks the second phase of a two-year endeavor to develop a national electronic health record (EHR) software solution based on an open systems approach, with DSTC completing the initial analysis and design phase in March 2003. The latest HealthConnect trial, which aims to provide improved support for consumers with diabetes in Brisbane’s southern suburbs, will test the value, technical feasibility and sustainability of an electronic health record. The trial is jointly funded by the Department of Health and Ageing, General Practice Computing Group (GPCG) and Queensland Health, and initially aims to recruit about 1000 consumers who visit participating clinics in the Brisbane South area [7].

### **Cambodia**

In Robib, a very isolated village in Cambodia, a nurse and a technician visit once per month to administer medical examinations and treatments

for sick patients incapable of traveling to the nearest medical centre or hospital. When the nurse is unable to diagnose a given ailment on-site, the technician takes a digital photo, which can then be transmitted via a wireless Internet connection to a doctor at a medical institution, such as the Harvard Medical School for instance [8].

### **Indonesia**

Hospitals in Indonesia have an electronic hospital information system for their medical record, but they generally build their own system from many sources. To create their own system they purchase a system from a developer(s) or imported it from abroad. There are many developers and IT consultant in Indonesia with many coming from Malaysia, Singapore, and India.

Indonesia has offered a number of Hospital/Health Information System Seminars. Several include: (1) choosing the right Hospital Information System Software by PERMAPKIN (Jakarta, April 28<sup>th</sup> 2004. PERMAPKIN is an Indonesian College for Healthcare Executive, <http://www.permapkin.or.id>); (2) Health Information System and Develop Data Bank of Health at the City by Ministry of Health Republic of Indonesia (Jakarta, August 27<sup>th</sup> 2004). Indonesia MOH’s website: <http://www.depkes.go.id>; and (3) Legality of e-Document to support Hospital Management System by Outpatient Department Dr Soetomo Hospital Surabaya East Java, September 22<sup>nd</sup> 2004, <http://irj3.tripod.com/semilokakarya>.

Indonesia established 2 health/medical websites that produce only Medical/Health News to inform what is occurring throughout the country. One site is hosted by a pharmaceutical company in Indonesia, <http://www.kalbefarma.com> and the second is hosted by the Indonesian Hospital Association, <http://www.pdpersi.co.id>.

### **Japan**

Japan has a significant number of initiatives to create a national electric health record. They envision involving many physicians and others belonging to different hospitals to share information. One approach includes using a Web-cgi-SQL database. However, they are facing the problem is how to complete a concise and satisfactory medical history. In order to meet these requirements, they propose 1) to record the visits of the patient on an IC card, 2) to establish a regional hospital visit directory service. This system would contain only the history of visits to regional hospitals, and each hospital would maintain its own detailed medical information internally. We will demonstrate how this system works, and will discuss problems which will arise in the development of this system [9].

Japan e-Health Trends: Japan e-Health Trends segments the Japanese e-health market into four key component areas - Pharma (pharmaceutical industry), Patient, Provider (practicing clinicians) and Payer (health insurance providers), i.e. the 4Ps of e-Health. The focus of the study, based on a combination of online survey and face-to-face interviewing methodologies, has been on Pharma, Patient and Provider areas where the change management issues have been most critical. The report evaluates the various e-health growth and barrier segments in view of current trends and healthcare professional-physician-consumer attitudes [10].

### **Malaysia**

Malaysia has adopted a national level strategy to leapfrog the country’s healthcare system to a new e-Health paradigm. This plan was conceptualized 7 years ago. The Malaysian government envisages a transformation of its healthcare system to take place that will lead to a nation of healthy individuals, families and communities through

the adoption of information technology. This strategic approach will be patient-centric and will emphasize on wellness, seamless and continuity of care delivery. With that, the citizens will be empowered with knowledge to perform self-care in the community setting.

Since its inception, significant milestones have been achieved. Two “paperless and filmless” pilot hospitals were rolled out. Thirty-four other such hospitals are in the pipeline to be rolled out in 2 phases over the next couple of years. There are 42 health centers linked up with tele-consultation technology. In addition to that, clinical information systems (CIS) have been implemented in 37 health centers and 2 district hospitals. 14 intensive care units (ICU) have managed to converge their information into a central repository. At least 3 clinical pathways were successfully incorporated into clinical information systems. This paper also examines the Malaysian e-Health strategy as a whole from six different perspectives, namely political, economic, social, technological, ethical and legal aspects of the project.

The critical success factors of Malaysian e-Health implementation are said to be “beyond technology”. Most of the current challenges faced by Malaysia are of non technological in nature. Among the most important challenge is the shortage of domain experts in designing, development and deployment of e-Health projects. This shortage is also apparently in the area of healthcare informatics standards development, adoption and integration. Future challenges anticipated by Malaysia are technology obstacles related to availability, performance, user interface, and privacy and information security.

The business opportunities in e-Health in Malaysia are tremendous, with a lot more room for expansion of the project scopes. The wealth of knowledge gained by Malaysia from these projects can be shared with other coun-

tries. So that a truly seamless regional healthcare that transcends the geopolitical boundaries can be attained.

### **Nepal**

HealthNet ([www.HealthNet.org.np](http://www.HealthNet.org.np)) is a international NGO providing health care information and communication services in the development world. HealthNet Nepal began in 1994, and has since become the premier provider of health care-related information to over 500 users in 134 organizations throughout the kingdom. By providing services such as e-mail, reports, computerized medical records and statistics, and a comprehensive library of medical information and useful links, HealthNet gives users access to a wealth of information on how to protect themselves from a variety of viruses and diseases. For instance, Nepal has a chronic problem with water contamination, and HealthNet provides the tools for users to arm themselves with information to avoid or effectively address illnesses related to a given water problem. HealthNet is currently in the process of updating and expanding its services to all of the country’s health care practitioners [11].

### **Republic of Korea**

One of the most computerized parts of the health sector in the Republic of Korea is the Health Insurance Review Agency (HIRA) ([www.hira.or.kr](http://www.hira.or.kr)), an independent agency set up in 2000 to review and process health claims. With close to 600 million claims a year, HIRA has a strong incentive to promote efficient and timely processing through the adoption of information technology. It has been actively encouraging medical care institutions to adopt electronic data interchange (EDI) technology for submitting claims. HIRA has a backbone network connecting its seven regional offices through high-speed ATM links to the headquarters in Seoul. Medical institutions can log into HIRA’s site to submit their claims.

Although not all health-care providers use the EDI system to make their reimbursement claims, most do. Out of a total of 63,675 medical care facilities, 42,280 are connected to the network and HIRA receives 77 per cent of all claims electronically. An additional 15 per cent are submitted by diskette and the remaining claims are sent in paper format. The benefits of electronic processing have been enormous. Errors have been cut back significantly, and overall wastage of time and resources substantially reduced. Besides making the processing of medical claims more efficient, the system also allows patients to check their medical records. HIRA has a near-term target of having over 90 per cent of medical institutions submitting electronic claims [12].

### **Europe**

The “European e-Health Area” has stated its goals as follow:

- National level: By 2005, Member States are asked to develop national and regional e-Health strategies. A public portal will be launched to provide “one-stop shop” access to information on health in the entire EU.
- Interoperability: By 2006, national healthcare networks should be “well advanced” in their efforts to better exchange information and ‘talk’ to each other. As part of this effort, standards for electronic health records are to be agreed so that patients can be identified and information made easily readable and exchangeable over the network. Movement of patients and healthcare professional should as a result be made easier.
- Networks: By 2008, health information and services are to become commonplace and accessible over both fixed and wireless broadband networks. Expected services include tele-consultations, prescrip-

tions available online. So-called "Grids" are to be set up to boost the networks' computing power and ability to interact.

Meanwhile, an important step is to be made with the introduction of a European health card as of 1 June 2004. The card is set to replace current administrative procedures to cross-border healthcare in the EU (forms E111, E128, E110, etc.) with a single personalized card.

### **Bulgaria**

Bulgaria faces another e-challenge after the government adopted an E-Health Action Plan over the project for developing an electronically based health information and services system. The health institutions of Bulgaria, including the health ministry, the national health fund, Non Governmental Organizations and academic associations in the field of health are working on developing an e-health strategy with experts from the European Commission [13].

### **United-Kingdom**

The United-Kingdom-based Isabel Medical Charity, "Isabel.org.uk", was designed in response to a misdiagnosis that almost killed a three year-old named Isabel. The parents of Isabel created the site in 2000 to provide clinical decision support for pediatricians in order to avert misdiagnoses and preventable illnesses. At the heart of the site is Autonomy Corporation's sophisticated cataloging software, which allows members of the medical community to input patient symptoms to retrieve a range of 15 diagnoses from a library of over 3,500 entries. The site also contains an annotated image library that allows doctors to compare x-rays and clinical pictures from a variety of medical fields [14].

The government in the UK has an ambitious 'e-health' agenda for further computerizing the healthcare sys-

tem in order to make it more efficient and reliable. This strategy aims to introduce lifelong electronic patient records and to offer seamless care through the sharing of information. This represents one of the most demanding and complex IT projects in the UK. If this agenda is to be met, informaticians are faced with major challenges to integrate a vast array of systems and technologies across the sector, including management and decision support systems, operational systems, and medical imaging, reporting and office systems. IT developments in Pathology are just one example of how this IT integration is occurring. The Pathology department at Leeds General Infirmary is developing a computerized blood testing process to deal with the half a million samples taken and tested each year. This process is best illustrated by following the progression of one blood sample, from one individual patient, through the diagnostic process. The patient is first identified by scanning their wrist tag with a portable computing device. The doctor uses this device to select the required tests and takes a blood sample from the patient. The portable computer then prints a bar-coded label for the blood sample which uniquely identifies it in the hospital information system. From here, the sample is automatically transported to the Pathology laboratory for analysis by an air tube transport system. On arrival, the sample's bar code label communicates to the automatic analyzing equipment which of the 300 or so possible tests are required for this particular sample, and the machinery will then perform the appropriate tests. During this process, samples can be tracked at any point by their barcode reference. Once complete, the test results are communicated electronically back to the hospital results server, and from there to the hospital consultant or local GP. There is enormous scope for yet further improvements in

the efficiency and automation of these processes, in order to remove errors, ensure security, and prevent system failure, and so on. These represent a huge range of challenging projects to be tackled by tomorrow's health informaticians [15].

## **South America**

Among the problems facing health and healthcare in Latin America and the Caribbean, the need to provide expanded and equal access to quality healthcare services and, the need to reduce or at least control the rising costs of healthcare services are very important. The following represent examples of what is happening in South America.

### **Bolivia**

The constant flow of information throughout the world has made it easier for physicians to diagnose a variety of illnesses and identify new treatments for a multitude of diseases. This information, which is collected in massive databases, has given both physicians and patient's access to more information about health improvement and risk assessment. The Bolivian Familial Cancer Database is one such international database that allows physicians to compare and contrast tumor and non-tumor features of a person's genetic makeup with existing database entries. This interactive database already contains over 300 entries and is updated regularly. Another similar site administered by Harvard University allows users to calculate their risk of getting cancer free of charge. Overall, ICTs and access to the global information network are allowing citizens around the world better prepare for and treat cancer and other illnesses.

### **Brazil**

During the past two to three years there was a marked increase of infor-

mation systems usage in healthcare. Brazil has a mixed hospital system of government controlled (70%) and private run (30%) hospitals. On the other hand hospital expenses reflect a difference. Generally the government expenses are 40% and private expenses are 60%. Private healthcare is more expensive, probably more efficient in most of the cases, but public shows similar clinical outcomes. The public system receives around 8.5% of the national GP, meaning 50 billion US dollars/year, or roughly 100 dollars per person.

Brazil has introduced the National Health Card. This card is probably the most substantial new technology that was introduced in the last few years. The card has both a magnetic stripe and printed information that has the person 15 digit unique number. More than 100 million people are registered, but less than 10 million cards were actually issued. The card is an attempt to have a unique identification for each citizen and open the potential to gather healthcare data for the country or for the patient's record. Issuing more than 180 million cards is proving to be a VERY difficult task. The main problem is political, not technical.

On the hospital side of healthcare there are many initiatives. There are about a dozen of good/very good information systems that are being used. PACS is also being implemented at a very fast pace. Telemedicine is still in its infancy, but growing, especially with results of ECG analysis, and teleradiology.

Education is very important in a large country, diverse cultures, and a wide spectrum of professional formation. This is probably one of the main areas of investment in the near future. All government agencies are increasing their budgets for continued education programs, distance learning, etc. Administrative systems are almost a common place by now. Most hospitals/clinics will have some computer-

ized support for their operation and logistics. Some will have more complete electronic records for their patients, but most will focus on billing/receivables, supply chain, physical patient management. Laboratories are implementing new systems as part of their ISO 9000 goal.

On the technological high-end the country has interesting experiences on:

- New technologies for multimedia/ Internet education of healthcare professionals
- Combining non-structured data (images, signals) into the Patient Record
- Mobility technologies (the country has poor legacy/wired infra-structure investment, thus wireless options are spreading very fast)
- The National health card
- Intelligent systems to monitor/manage the SUS (National Unified Healthcare System)
- More emphasis on homecare actions (the country already started, few years ago its Family Health Program)

### Uruguay

Uruguay touches Brazil in the north-east, Argentina in the south-west and the Atlantic Ocean on the south. There are 3.4 million people in the country. Half of the population lives in the capital and 91% lives in urban areas. The literacy rate is 97%, and the public system provides compulsory education from age four. Life expectancy is 75 years (71-79) and infant mortality rate is 15 deaths/1000. <http://www.ine.gub.uy/>

10% of the Gross Domestic Product is spent in health care. The private sector is dominated by non-profit organizations which provide services through prepaid health insurance cover approximately 55% of the population and exist since the 19<sup>th</sup> century. One third of the population is covered by the Ministry of Health Public System and the rest is assisted by the military

and police health systems and other smaller ones

Uruguay has created new regulations regarding the Electronic Health Record in Uruguay. The new regulations foster the creation of a unique electronic medical record, in a segmented Health system, assure the legality of electronic support, in every aspect, preserve the confidentiality of individual clinical information, and assure the interrelationship among systems, through the use of standards

The regulations are directed toward "the creation of a unique electronic health record for each person, from perinatal information until death, is declared of public interest" <http://www.presidencia.gub.uy/decretos/2003093001.htm>

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## The Middle East

### Syria

E-health initiatives and medical informatics in Syria are at an early stage of development in all sectors. In the Syrian Ministry of Health, the directorate of Decision Information Support was established few years ago in the ministry building in Damascus. It supports all parts of the ministry with personal computer hardware, training of the staff members, and networking. It also started a pilot projects in the fields of Electronic Medical Records and a Smart Card System. It also plans to provide Internet Service Provider. [www.moh.gov.sy](http://www.moh.gov.sy)

Syria held an E-Health Seminar: Mapping the Future of E-Health in Syria, that was sponsored in cooperation with the Ministry of Health at the Syrian Telecommunication Establishment in Damascus on Tuesday 12th October 2004. The Seminar Recommendations include:

1. To focus on the necessity to carry out a survey on the health sector in Syria.
2. To stress the importance of adopting Medical Record of patient in Syria.

3. To suggest a national program aimed at identifying the information that needs to be registered in the Medical Record.
4. To carry out a pilot project with the help of NOSSTIA to automate patient medical records, taking into account international health standards, as WHO offered the help and support in this projects .
5. To prepare for a medical conference specialized in E-health in cooperation with the Ministry of Health, Ministry of Higher Education, Ministry of Communication and international organizations).
6. To prepare for a summer Training Project on E-Health to be held in Tartous and to identify partners, audiences, topics, speakers, location, time and a cost estimation.
7. To participate in the development process of human resources in local hospitals

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## Africa

### Ghana

Since 1989 Dr. Fred Binka and his staff have been conducting a project named "Health Net Project". It aims to improve the quality of life in Northern Ghana. The Guinea Savannah of Northern Ghana is possibly the most risky place to live during infancy. For every 1,000 children born, 222 die before age 5. The most common causes of death are malnutrition, measles, lung infection and malaria. Dr. Binka explains, "We are building a large database containing the names, ages, pregnancies, births, illness, recoveries and deaths" of the populations there. To educate the population and know where to send this information, the Center uses Digital Mapping. A device the size of a calculator uses satellites to isolate landmarks such as family compounds. With a computer map that shows where planning is being practiced, the areas that require attention become obvious. Information on

screen reveals discrepancies better than numbers on charts [16].

### Kenya

Administering and monitoring therapy is crucial to the battle against HIV/AIDS in sub-Saharan Africa. Electronic medical records (EMRs) can aid in documenting care, monitoring drug adherence and response to therapy, and providing data for quality improvement and research.

Faculty at Moi University in Kenya and Indiana and University in the USA opened adult and pediatric HIV clinics in a national referral hospital, a district hospital, and six rural health centers in western Kenya using a newly developed EMR to support comprehensive outpatient HIV/AIDS care. Demographic, clinical, and HIV risk data, diagnostic test results, and treatment information are recorded on paper encounter forms and hand-entered into a central database that prints summary flow sheets and reminders for appropriate testing and treatment. There are separate modules for monitoring the Antenatal Clinic and Pharmacy. The EMR was designed with input from clinicians who understand the local community and constraints of providing care in resource poor settings.

In 2001, the Departments of Medicine and Child Health and Pediatrics at Moi University, Eldoret and the Department of General Internal Medicine and Geriatrics at the Indiana University School of Medicine, in collaboration with the Moi Teaching and Referral Hospital in Eldoret, Kenya, established AMPATH: the **A**cademic **M**odel for **P**revention **A**nd **T**reatment of **HIV/AIDS** [1, 2].<sup>1, 2</sup> AMPATH has the tripartite mission of patient care, medical education, and research focusing on HIV. It was the first organization to offer comprehensive ambulatory HIV/AIDS care in Kenya, including highly active antiretroviral therapy (HAART). Patient care also includes the management of opportunistic and other infec-

tions, nutritional and psychosocial support, and prevention of maternal to child transmission of HIV using both HAART and Nevirapine, as well as diagnostic services. The AMPATH Training Institute (ATI) offers both didactic courses and mentored apprenticeships in the comprehensive care of the HIV infected patient via multidisciplinary health care teams.

To date, the EMR contains more than 30,000 visit records for more than 4000 patients, almost half taking antiretroviral drugs. We describe the development and structure of this EMR and plans for future development that include wireless connections, tablet computers, and migration to a Web-based platform.

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## North America

### Canada

Canadians value their health care system above any other social program.

The Canadian healthcare system is undergoing widespread review, nationally, and within each province and territory, where the bulk of care provision is financed and managed. The challenges are being addressed by national, regional and provincial initiatives in the public, private and not-for-profit sectors.

Canada created the Canada Health Infoway project with mandate: to accelerate the development and adoption of electronic health information systems in Canada. *Infoway* was created in response to a commitment of Canada's First Ministers to "work together to strengthen a Canada-wide health infrastructure to improve quality, access and timeliness of health care for Canadians." *Infoway* is an independent, not-for-profit corporation, and a genuine partnership of federal, provincial, and territorial governments. Its members are the deputy ministers of health from across Canada.

*Infoway* now has \$1.1 billion in investment capital. The Government of Canada allocated an initial \$500 million in 2001, and provided an additional \$600 million following the 2003 First Ministers' Accord on Health Care Renewal. The three main goals of *Infoway's* telehealth program are to optimize the use of existing networks, maximize the use of telehealth in the clinical setting and to maximize the link between telehealth and Electronic Health Records to benefit patients.

### United States of America

While skyrocketing healthcare costs and HIPAA compliance are the main drivers for the adoption of electronic health records, government and payers are beginning to recognize the value of Electronic Health Records (HER). EHR implementation is moving from larger institutions to pre-ambulatory care, although this migration will be difficult because of the complex legacy systems installed in hospitals [17].

In April of 2005 President George Bush announced plans to establish a national electronic medical records system within in the next decade and created a new national health information technology office within HHS. Dr. David Brailer was named as the national health information technology coordinator, a role designed to support government and private sector efforts to develop standards and infrastructure for using IT to promote better care quality and reduce health costs. The new HHS office will first examine options to create incentives in Medicare and other HHS programs to spur the adoption of electronic health records. President Bush is "trying to drag medicine into the 21st century" with his proposal to make electronic health records available to most U.S. residents within 10 years, according to a editorial. The efforts could "help

break down resistance to computerizing records" in the medical community, which is "moving too slowly to adopt the new technology," the editorial states. According to the editorial, the "payoff" from a national EMR system "could be substantial." EMRs could improve healthcare quality, "better gauge the effectiveness of health providers and ultimately change how they are paid to a system based on the quality of their results instead of the quantity of services," the editorial states. Although some health care providers maintain that "new technology is expensive" and "proof is lacking that the investment would pay off financially or result in improved patient care," the editorial states that the cost "isn't exorbitant" and that physicians who have implemented EMRs "say they make fewer mistakes and provide better service." The editorial adds that HHS has said the nation could save \$140 billion per year through a national EMR system, concluding, "That's certainly worth the investment" [18]

### Summary

The items listed are a very small sample. If your country does not appear on this list, I apologize.

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