



**Electronic Health Records:  
A Global Perspective**

**Second Edition**

**Part II**

**A Work Product of the  
HIMSS Enterprise Systems Steering Committee  
and the Global Enterprise Task Force**

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## ASIA PACIFIC

### HONG KONG

#### **Overview of Country Healthcare System**

Hong Kong has 43 public hospitals and 12 private hospitals that serve a population of 6.83 million people with 25 million visitors to the country per year. It boasts one of the world's lowest infant mortality rates and longest life expectancies.

Hong Kong spends five and a half percent of its GDP on healthcare: 57 percent in the public sector and 43 percent in the private sector.<sup>1</sup> Public funding is governed by the Food and Health Bureau (FHB), one of 11 public bureaus responsible for public policies. Within the FHB, the Department of Health oversees public health measures and the Hospital Authority (HA) manages all public hospitals and government outpatient clinics.

The HA was formed in 1990 to manage all public healthcare services including 43 public hospitals/institutions, 47 specialty outpatient clinics and 74 general outpatient clinics. The public sector has a total of 27,742 hospital beds and 29,000 clinical staff delivering over one million inpatient visits, two million emergency visits and 13 million outpatient visits annually. One hundred percent of long-term care, 93 percent of inpatient and tertiary care and 24 percent of primary care are provided by the HA with the balance provided by the private sector.

#### **Computerized Patient Records Systems**

HA first developed its IT infrastructure in 1991, including financial, human resources, patient administrative and departmental systems. In 1994, it began developing its Clinical Management System (CMS), an integrated computerized patient record system that gives clinicians access to all available electronic clinical information on their patients. HA adopted a centralized approach in developing its CMS for clinical care, greatly reducing IT cost per hospital. Inter-operability between different hospitals was one of the key aims in developing the clinical management system. Thus, in Hong Kong, 160 facilities in the public sector use the same CMS. The system has a familiar user interface to enhance the efficiency in a busy clinic setting. The HA CMS has very high user acceptance and is in use in everyday care delivery.<sup>2</sup>

The EPR was first developed in 2000 using a unified information model.<sup>3</sup> It provides a standardized repository of all clinical data collected throughout the HA and offers a clinician-friendly view into the comprehensive longitudinal lifelong record of the patient. In addition, the EPR acts as a data source for clinical decision support, and a rich resource for audits, research and reporting. The EPR is comprehensive in scope and includes details of patient episodes and visits; diagnoses; procedures; discharge summaries; allergies and alerts; all medications; laboratory and radiology results; nursing and allied health information; documents and letters; and specialist clinical data. In recent years, radiological images have also been available throughout the HA as part of the EPR and patients can also elect to share their health record with clinicians outside the HA. As of 2007, eight million patient records are held in the EPR.

Hospitals and clinics	164	CMS transactions	3 million daily
Visits	15 million	EPR transactions	590,000 daily
In patient admissions	more than 1 million	X-ray images	32 million
No of patient records	8 million	Laboratory items	800 million
		Prescription items	340 million

The CMS and EPR are integrated across all settings throughout HA facilities including emergency, inpatient, outpatient and outreach services. CMS and EPR are essential clinical and management tools for Hong Kong and, together, handle over three million clinical transactions per day.

Computerization in the private healthcare sectors is less developed. While most of the 12 private hospitals have financial and administrative systems, CPOE and clinical documentation are still in their infancy. In the ambulatory sector, only 20 percent of the 5,000 private practitioners use computerized patient records systems.

## **Overview of EHR Program**

### ***Governance***

In recent years, several government papers and reports have highlighted the need for patient records (with patient consent) to flow freely between different care settings in both the public and private sectors. To accomplish this goal, the Food and Health Bureau has established a steering committee on E-Health Record Sharing. Stakeholders from both the private and public healthcare sectors form this committee and their mutual goal is to build consensus and gather expertise for the development of a territory-wide information system. In turn, this will enable sharing of all patient records throughout the healthcare system. Until this happens, governance in the public sector is driven by the HA.

The HA has instituted formal clinical IT governance structures and processes<sup>4</sup> in which the public hospitals and more than 120 clinicians from all specialties are engaged in the design, development and implementation of the clinical systems. This emphasis on clinician engagement and ownership has achieved high utilization rates and produced real clinical and business benefits. In addition, strong portfolio management with control of scoping and prioritization has led to a very cost effective program. To date, the HA has spent US \$200 million on the development and implementation of this clinical informatics portfolio. For future development, the HA has established “Clinical Systems Strategy 2007-2012,” a Phase III program of the CMS that will extend the benefits of e-health to the private sector.

## **Policy and Legal Requirements**

### ***Patient Privacy***

Hong Kong is addressing the privacy rights of patients through its Personal Data Ordinance. This regulation applies to any person (data user) who controls the collection, holding, processing or use of patient data. In addition to the Personal Data Ordinance, the Medical Council of Hong Kong regulates clinicians through the Professional Code of Conduct that includes the handling of patient information.

### ***Data Sharing***

Six guiding principles have been proposed for sharing information through the EHR:

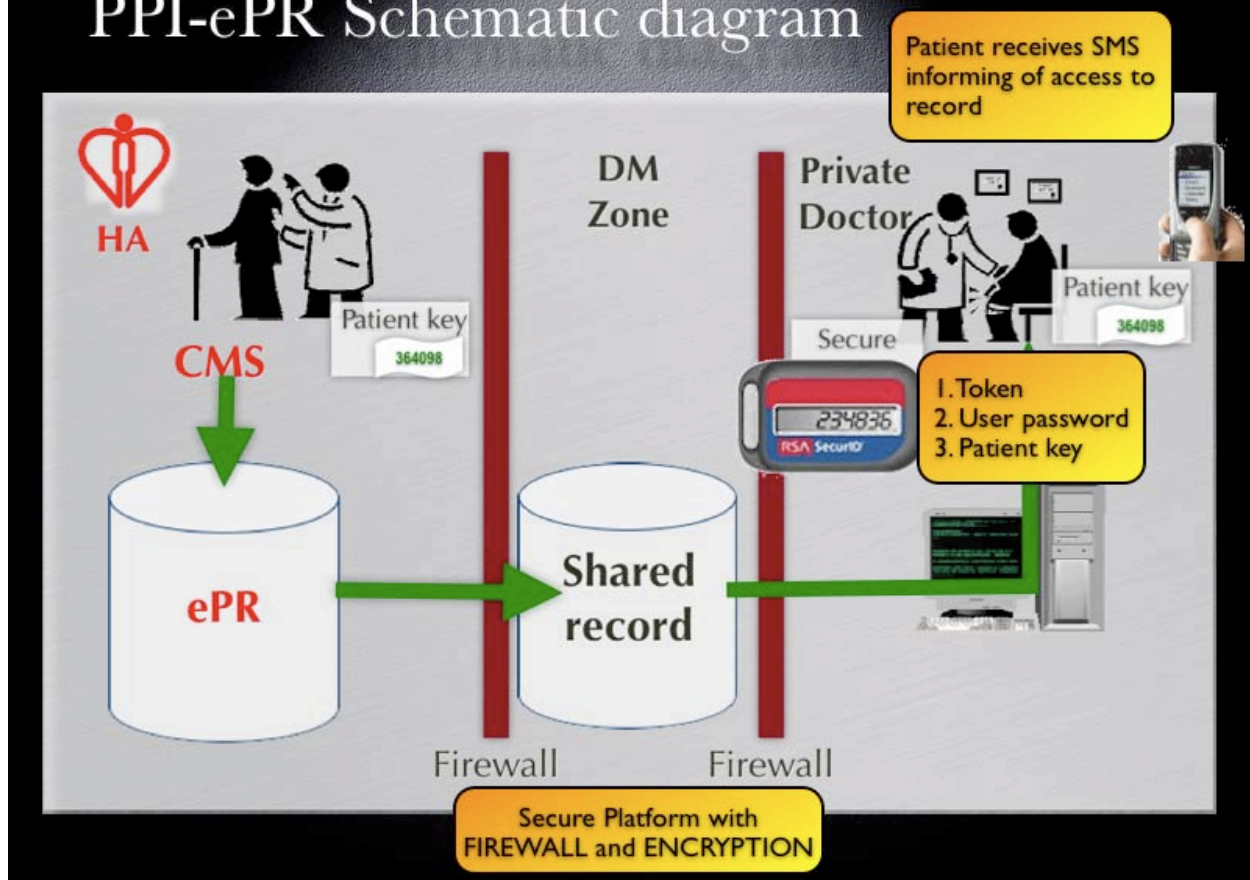
1. Record sharing should be compelling but not compulsory;
2. Corporation institutional structures should be developed that facilitate sharing of information;
3. A self-sustaining business operation model should be developed to continue this process;
4. Privacy and security should be maintained at all times;
5. Open technical standards should be employed; and
6. A “building block” approach should be employed to promote the system’s adoption and ease its implementation over time.

### **Technology, Adoption and Outcomes: PPI-EPR Sharing**

The PPI-EPR sharing project was established in 2006 as the first large-scale feasibility test for sharing patient records between public and private healthcare sectors. After receiving patient consent, clinical records are shared with participating clinicians through an Internet portal. The patient is assigned a PIN (personal identification number) and his EPR record is then extracted and encrypted into the secure PPI-EPR database.



# PPI-ePR Schematic diagram



Physicians in the private sector who participate in this project are also given a PIN and a security token in which a six-digit number is refreshed each minute. The physician uses his/her PIN and token number, combined with the patient's Hong Kong identity number and PIN, to access the patient's record. Upon successful authentication the PPI-EPR will display the patient's record on the Web browser, protected by SSL-VPN. As an additional security measure, a Systems Management Server (SMS) message will be sent to the patient's mobile phone, alerting him of the physician's access to his record.<sup>5</sup>

As of October, 2007, over 15,000 patients, 800 private physicians and private hospitals totaling 600 beds have enrolled in the project.

## EHR Next Steps

Three work groups have been created to manage the key issues involved in setting up a national EHR system in Hong Kong. These are the:

1. Work group on institutional arrangements;
2. Work group on legal, privacy and security issues; and
3. Work group on e-health record and information standards.

Recommendations from all three groups will form the consensual basis for all future EHR development for Hong Kong. In the meantime, the PPI-EPR project will continue to extend its scope to more private healthcare settings and to pilot two-way sharing with selected physician groups.

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# INDIA

## Overview of Country Healthcare System

*Picture this: At a world-class hospital in New Delhi, a cardiovascular surgeon performs endoscopic cardiac surgery using the world's most advanced telerobotic surgical system. Less than 40 kms away, a traditional (non-qualified and untrained) birth attendant manages a childbirth at a home in the capital's slum.*

This case in point reflects one of the numerous stark realities pertaining to the delivery of healthcare services in India. With a population of approximately 1.13 billion, the world's largest democracy has a varied healthcare landscape. When it comes to healthcare, Pricewaterhouse Coopers has suggested that there are two Indias: one that provides high-quality medical care to middle-class Indians and medical tourists and the other (in which the majority of the population lives) in which limited or no access to safe, quality care is available.

Medical tourism is exploding in India. The country's private health sector attracts a continuous influx of patients from overseas and "corporate hospitals" that offer world-class medical treatment at fees that are 10-15 times lower than anywhere else in the world.

The rest of India suffers from historically poor public health infrastructure and grapples with intransigent healthcare issues such as burgeoning HIV-AIDS cases and other chronic and degenerative diseases.

Healthcare in India is governed by the Ministry of Health and Family Welfare through its three departments: the Department of Health, the Department of Family Welfare and the Department of AYUSH (Ayurveda Unani, Siddha and Homeopathy). Healthcare services are provided through both the public (state and federal) and fee-levying private sectors.

The Indian healthcare infrastructure consists of:

- 15,000+ hospitals (two-thirds of which are public owned);
- 875,000 hospital beds (40 percent of which are private);
- 500,000 doctors (18,000 new doctors are admitted into the delivery system annually);
- 737,000 nurses;
- 170 medical colleges;
- 23,000 primary health centers; and
- 132,000 sub-centers.

The private sector accounts for approximately 80 percent of healthcare expenditure. Of the remaining 20 percent; more than three-fourth is funded by respective state governments. Today, the Indian Healthcare sector is valued at approximately \$34 billion and comprises six percent of GDP.

At present, medical tourism and health insurance markets are the key growth opportunities within the Indian healthcare sector. There has been significant growth in the medical tourism sector with the corporate hospitals focusing on this sector. The health insurance market has been slow to get traction.

The challenges faced in the Indian healthcare sector include a weak and inadequate physical infrastructure, inability to provide health insurance to all who need it, a lack of availability of trained medical and paramedical personnel, and limited geographic availability of public health facilities who suffer from operational inefficiency.

## **National EHR Program**

### *National IT/ICT Status & Strategy*

The Information Technology Act was passed in May 2000 and enforced in October 2000. The Act covers e-commerce, the creation and use of digital signatures, transactions, contracts, and the facilitation of electronic records. It is influenced by the Model Law on Electronic Commerce (UNCITRAL).

India is gradually positioning itself at the global level as “an IT superpower” and “destination BPO (or Business Process Outsourcing).” Its IT and outsourcing sectors reached \$22 billion in annual sales in 2005 and employed more than 700,000 workers. India’s adoption of IT is matched by growing positive change in public policy on infrastructure and sponsorship. Advancements in IT are further being fueled by the increasing rate of PC and Internet penetration in the country as a result of the following factors:

**Increased teledensity:** As a result of increased availability of infrastructure, lower cost of communications services and increased affordability of personal computers, the number of fixed telephone lines per citizen (teledensity) has increased from 2.5 percent in 2000 to nine percent in 2005; PC penetration has increased from 4.3 per 1000 people in 2000 to 14 per 1000 people in 2004.

**India’s broadband policy:** Although unveiled in 2004, India’s rate of adoption of high-speed broadband Internet access has been slow. By the end of 2006, there were only 2.1 million broadband subscribers – a penetration of less than 0.2 percent. The Broadband Policy, set by the Department of Telecommunications, called for a penetration of broadband subscriptions of three million users by 2005, nine million by 2007 and 20 million by 2010. The preferred mode broadband delivery has been through DSL (Digital Subscriber Line). Internet Service Providers (ISP) typically use fiber optics; approximately eight lakh route kilometers (0.8 million) of fiber has been laid.

In 1997, the Indian government positioned itself as one of the early adopters of healthcare IT among developing countries when it launched its “Development of Telemedicine Technology” project. The Department of Information of Technology at the Ministry of Communications and IT and the Department of Space along with the Ministry of Health and Family Welfare have been the government’s healthcare IT flag bearer agencies.

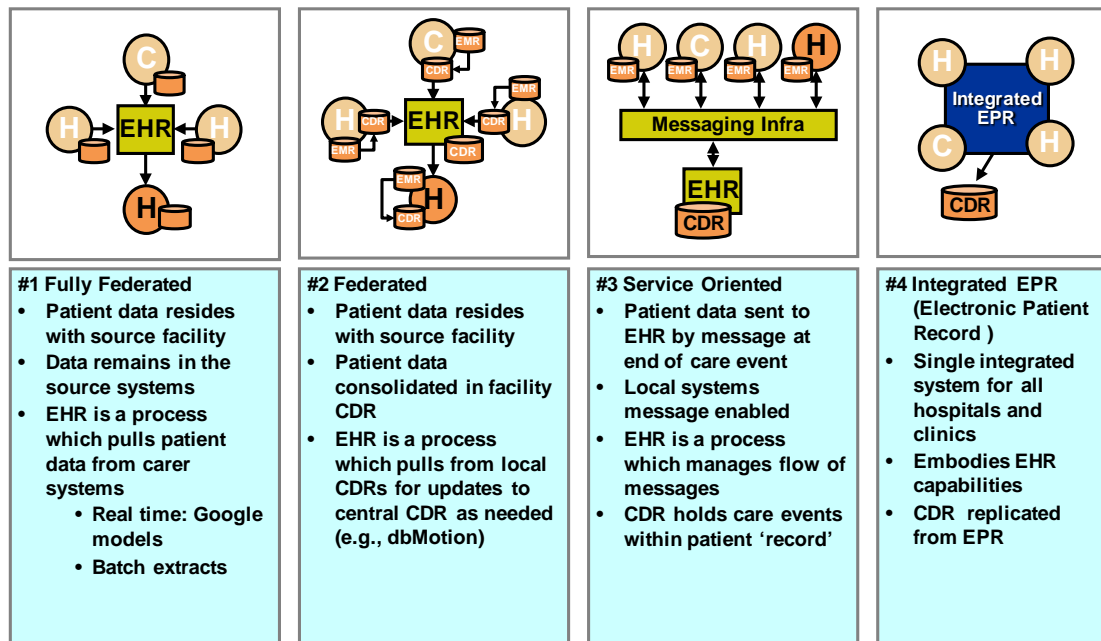
The Ministry of Communication’s Department of IT recognized the need for standard health IS across the country, principally to meet the needs of service providers and consumers who record, use, transfer and disseminate health information. To this end, the Department established another initiative to prepare the ground for Information Technology for Healthcare (ITIHC). In 2003, the Department published a “Framework for Information Technology Infrastructure for Health in India.”

The National Knowledge Commission (NKC) of the Government of India, an influential advisory body, in 2007 came up with recommendations for setting up an Indian Health Information Network, establishing national standards for clinical terminology and health informatics and creating a common national EHR.

### National /Regional EHR Approach

The recommendation by the NKC for the Indian Health Information Network calls for all the healthcare establishments in the district to connect to a central data repository. All the district nodal data repositories will connect with a state level data bank that in turn will connect to a central data bank.

This would best be described as a “Federated” model (category #2) in the following diagram.



NOTE: EHR is a service not just a data repository i.e. does processing; further details provided in the next slides.

### EHR Governance

#### Legal /Regulatory

While there are recommendations about patient privacy and protecting health data of citizens, there are no legal/regulatory mechanisms in place for the implementation and deployment of HIE.

### ***Healthcare Policy***

The Ministry of Communication's Department of IT has published the "Framework for Information Technology Infrastructure for Health in India," centered on the philosophy that "information is determinant of health" and that "healthcare is one of the key areas that can benefit from the use of IT." The framework encompasses billing formats, clinical standards, data elements, minimum data sets, health identifiers, messaging standards and education framework. While this framework has been published, there has is not much awareness or application of it.

### ***Technology***

The NKC recommendation for the Indian Health Information Network is to develop a Web-based health information network with a "hub and spoke model." This will be an interoperable national grid with national standards in health informatics to facilitate messaging, collation and analysis of healthcare data. A common national EHR system based on the national clinical and IT standards is to be created.

### ***EHR Financing***

The NKC recommends that the early phase for the Indian Health Information Network and Grid should be government initiated and funded. Government investment should support the development of critical building blocks of this infrastructure such as the secure platform for data exchange and provide financial incentives to encourage public-private participation in development of the EHR systems. According to them, a major coordinated national effort with federal funding and strong support from the private sector is what is needed.

### ***Adoption***

Many hospitals have implemented "electronic records" locally. The scope of data captured, however, is limited to basic demographics, registration and billing. Larger hospitals that store clinical data electronically, store discharge summaries with information on procedures, orders and investigation reports. Some hospitals have implemented full EMR systems with functionalities such as clinical documentation, order entry and transmission and clinical decision support, but very few actually use most of these capabilities. As a result, clinical follow-up is either very limited or not feasible. Industry analysts feel that the goal of hospitals in India is more to adopt the general concepts of EHRs, but not for utilizing their functionalities.

Because there are no legal/regulatory requirements for adoption of standards, implementations at various hospitals are not interoperable. While vendors claim that they are working towards interoperable systems, several hospitals have deferred EHR investments until a stable, interoperable framework emerges across the country. Instead, they have been making cheaper

investments in billing and inventory management systems that have two-way interfacing with popular office automation tools.

### ***Outcomes***

The implementation of EHR varies by region, type of hospital and geo location of the hospitals. A few private hospitals have near state-of-art EHR platforms installed and operational. Given the IT boom, Indian IT companies have developed core competency and knowledge of healthcare systems across US/UK/Europe and Asia Pac. The knowledge capital would put India in a good position to take a leap in implementation once enough funding and government regulation is enforced. The prevalence of alternate medicine practices like Ayurveda, Homeopathy and Siddha is going to add a layer of complexity to EHR implementations.

### **Next Steps**

The NKC has recommended an execution plan to achieve three goals as next steps:

1. Establish national standards for health IT;
2. Establish a legal and regulatory framework; and
3. Create a financially viable time-bound implementation plan for the Indian Health Network and common national EHR.

An institutional body is to be set up with appropriate professional domain experts and adequate budget This body will frame laws and regulation and get them approved by the proper authorities, establish interoperable health IT standards and develop a national EHR The body will create an execution team to draw up the time bound implementation plan and financial plan as well as execute the program in phases with defined end points.

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## JAPAN

### Overview of Country Healthcare System

Japan, the world's second largest economy, claims to some of the best health statistics internationally. “Japanese citizens go to the doctor three times as often as Americans, have more than twice as many MRIs, use more drugs, and spend more days in the hospital, yet Japan spends about half as much per capita as the US... By law, everyone must buy health insurance – either through an employer or a community plan – and unlike in the US, insurers cannot turn down a patient for a pre-existing illness, nor are they allowed to make a profit.”<sup>1</sup>

### Comparison between Japan and US –Key Factors

Attributes	Japan	US
<i>General Statistics</i>		
Population	127.3 million	303.8 million
GDP	\$4.4 trillion	\$13.8 trillion
GDP/capita	\$33.3 k	\$45.8 k
Median Age of Population	43.8 years (42.1 male and 45.7 female)	
Age as a % of population	<i>0-14 years:</i> 13.7% (male 8,926,439/female 8,460,629); <i>15-64 years:</i> 64.7% (male 41,513,061/female 40,894,057); <i>65 years and over:</i> 21.6% (male 11,643,845/female 15,850,388) (according to 2008 estimates)	<i>0-14 years:</i> 20.1% (male 31,257,108/female 29,889,645); <i>15-64 years:</i> 67.1% (male 101,825,901/female 102,161,823); <i>65 years and over:</i> 12.7% (male 16,263,255/female 22,426,914)
Population growth rate	-0.139%	0.883%
Births/1,000 population	7.87	14.18
Deaths/1,000 population	9.26	8.27
Internet users as a % of population	88 million (69%)	223 million (73%)
<i>Healthcare Statistics</i>		
Healthcare Expenditures/capita	\$2,249	\$5,711
Healthcare as % of GDP	8%	15.2%
Public versus private sector health insurance spending	82.7% publically funded	67.1% privately funded
Life expectancy	82.1 years old	78.1 years old

<sup>1</sup> Casillas J. FRONTLINE travels to five countries in search of a universal health care system that could work in the US. *Medical Banking Blog*. 2008. Available at <http://edodds.blogs.com/mblog/2008/04/index.html>. Accessed November 27, 2009.

Pharmaceutical market	\$57.3 billion	\$281.9 billion
Drug consumption/capita	\$450.11	\$929.91
Physicians/1,000 people <sup>1</sup>	2.0	2.4
Nurses/1,000 people <sup>2</sup>	9.3	7.9
Number of healthcare facilities (hospitals and clinics)	9,122 <sup>3</sup>	7,569 <sup>4</sup>
Acute care beds/ 1,000*	8.2	2.7
Long term care beds/ 1000*	27	44

All data are from CIA Worldfact Book ([www.cia.gov](http://www.cia.gov)), with the exception of the following:

<sup>1</sup>Source: OECD Health Data 2007, <sup>2</sup> Ministry of Health, Labor and Welfare of Japan's Statistics Bureau 2006<sup>3</sup>US Census Bureau, 2009.

## Insurance Structure and Financing of Healthcare in Japan

There are two medical insurance systems in Japan: Social Insurance System for those working at a company or office and the National Health Insurance System for those not covered by the Social Insurance System. There are no health maintenance organizations (HMOs) in Japan. National Health Insurance is the medical insurance system designed to distribute medical expenses between the government and patients. Foreigners who have been in Japan for more than one year are required to join the National Health Insurance scheme. National Health Insurance will cover 70 percent of medical charges and the citizen must pay for the other 30 percent. The monthly premium of the National Health Insurance is about ¥4,000 (the fee differs by residential district). National Health Insurance is advantageous if you become seriously ill or need to be hospitalized. A 50-70 percent discount may be available if the citizen is not a wage earner.

Company employees are insured by the employer, who, as of 2008, are required to ensure each employee more than 40 years in age receives an annual physical exam from employer-sponsored clinics. The government mandates employers to ensure employers take these exams to promote healthy lifestyles and preventive care as an effort to reduce the healthcare costs for medical services received in public hospitals. Employers receive substantial tax breaks for supplying insurance to their employees. Retired people and unemployed are covered by community-based insurance, and government workers are covered by social insurance.<sup>2</sup> Because of the increased number of elders and the needs to provide more care that tends to have higher costs, the public Long-Term Care Insurance Program was started in 2000.

## Top Three Issues Facing Japan's Healthcare System

### *Caring for an Aging Population*

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<sup>2</sup> Tomisawa I. Overview of healthcare in Japan. Presentation at HIMSS AsiaPac 2007. May 2007.

According to OECD statistics, the Japanese elderly population is almost double that of the US, which is the segment of the population that requires the greater amount of the public healthcare expenditures. However, the actual amount of healthcare expenditure in Japan overall as a percentage is almost half that of the US, albeit caring for this demographic is challenging. By 2013, 25 percent of the national population in Japan will consist of people 65 or older; similarly, the elderly in the US are expected to comprise 20 percent of the national population by 2030, making both societies “Super Aging Societies.”<sup>3</sup> Because of prolonged life, due greatly to technological and pharmaceutical advances, there is a globally recognized need to match the capabilities of healthcare systems with needs of the elderly who live with chronic conditions as a natural part of aging.<sup>4</sup> These factors present societal challenges in elder care.

One challenge is the reduction in the availability of family members to care for the elderly due to changing family structures (e.g., fewer children to care for the elders as they age due to low birthrates that accounted for 9.4 and 14.4 births per 1000 people in Japan and US, respectively).<sup>5</sup> Another challenge to caring for increased aging populations is the decline in lifetime income available for consumption to younger Japanese and American generations to aid in providing for extended families.<sup>6</sup> There are a number of methods being employed to reduce costs associated with care for the elders. Related to this is the fact that drug expenditures in Japan are about half of the US (while this may not include Japanese herbal medicines that do not count as prescription drugs).<sup>7</sup> Because the majority of the drug expenses are increasing to support rising the elder population, the Ministry of Health, Labor and Welfare (MHLW) plans to raise the volume of generics in the market.<sup>8</sup> This level is about 7.3 percent of total pharmaceutical sales and is expected to grow to 30 percent by 2012, meaning that this sector will grow considerably at the expense of branded innovator drugs.<sup>9</sup> Costs reductions for administration expenses associated with providing medications are anticipated with increased e-prescribing. For example, e-prescribing will provide a means to track what drugs are prescribed and reduce the likelihood of duplicate prescriptions and associated costs. It will also be used to track what actually gets filled by a pharmacist, decreasing the likelihood of error and encouraging a means to monitor if a patient at least fills the prescription. This process can, in turn, provide a basis for evaluating drug regimens for effectiveness.

Lengths of stay in hospitals are increasing, reaching 19.8 days in 2005.<sup>10</sup> This is attributed to the elders staying longer in acute care facilities because they typically do not have feasible

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<sup>3</sup> Administration on Aging (AoA), Department of Health and Human Services (DHHS). “Statistics on the aging population.” Last updated in 2006. Available at <http://www.aoa.gov/prof/Statistics/statistics.asp>.

<sup>4</sup> Hozumi Y. The health care system in Japan: Current situation and future perspectives. *Japan Medical Association Journal*. 50(2); 2007:126-129.

<sup>5</sup> Population Reference Bureau (PRB). *World Population Data Sheet*. 2006. Available at <http://www.prb.org/pdf06/06WorldDataSheet.pdf>. Accessed November 27, 2009.

<sup>6</sup> Saito M. An empirical investigation of intergenerational consumption distribution. Ogura S, Tachibanaki T, Wise D, eds. In: *Aging Issues in the United States and Japan*. Chicago: University of Chicago Press; 2001.

<sup>7</sup> Rosen M. US-Japan healthcare comparison: Rapidly aging population, skyrocketing costs. *Wisconsin Technology Network News*. October 2008. Available at <http://wistechnology.com/articles/5140/>. Accessed November 27, 2009.

<sup>8</sup> Rosen, 2008.

<sup>9</sup> Rosen, 2008.

<sup>10</sup> Organization for Economic Co-Operation and Development. *OECD Health Data 2007*. Available at <http://lysander.sourceoecd.org/vl=1442251/cl=20/nw=1/rpsv/health2007/index.htm>. Accessed November 27, 2009.

conditions to be discharged for adequate home care (e.g., care provisions by family members or adequate support for home care coordinated by licensed care managers because of shortages in this workforce to handle the increased elder population).<sup>11</sup> Japan had the highest number of “acute care” hospital beds of all OECD countries, with 8.2 beds per 1000 population in 2006 – more than twice the OECD average (3.9 beds) and three times as much for the US (2.7 beds).<sup>12</sup> As seen with the OECD data, decreasing the number of beds is a trend. Essentially in Japan, acute care facilities have been turning into nursing home facilities to support care of the elderly, contributing to the rising costs of care. Japan is trying to move these patients to less costly home care settings. To pay for this, the country is reducing the number of hospitals (i.e., beds) with a goal of converting ¥3.8 billion by 2015 from acute care expenses to support home care. Community care-based approaches will become the standard-of-care.<sup>13</sup> The US intends to move to a more home care model as well to help manage chronic conditions that are naturally part of the aging process.<sup>14</sup>

### ***Workforce Capacity and Meeting Demands without Causing Care Disparities***

Another issue that plagues Japan and the US alike is in regards to workforce capacity to care. In Japan, there are fewer physicians per capita than most other OECD countries (i.e., in 2006, Japan had 2.1 practicing physicians per 1,000 population, well below the OECD average of 3.1 and the US at 2.4).<sup>15</sup> This low number of doctors per capita in Japan is due at least partly to government policies fixing limits on the number of new entrants in medical schools.<sup>16</sup> Another part has to do with the relatively low pay in comparison with other OECD countries. The following chart indicates the starting salaries of nurses and physicians in OECD countries based on the purchasing power parity (PPP), an adjustment across currencies indicating how much purchasing power the salary provides in the respective country. Japan pays relatively low wages for public sector physicians and nurses.<sup>17</sup>

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<sup>11</sup> Akiyama 2009.

<sup>12</sup> Organization for Economic Co-Operation and Development.. OECD Health Data 2009. <http://www.oecd.org/dataoecd/45/51/38979974.pdf>. Accessed November 27, 2009.

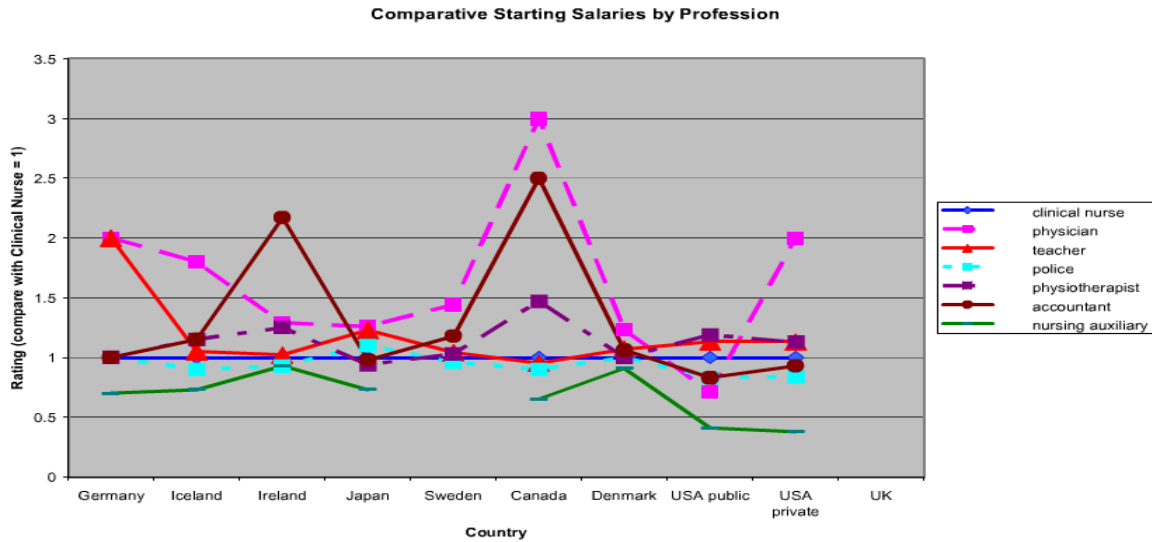
<sup>13</sup> Akiyama 2009.

<sup>14</sup> CAST 2005

<sup>15</sup> OECD Health Data 2008.

<sup>16</sup> OECD Health Data 2008.

<sup>17</sup> International Council of Nurses (ICN). “Nurse wages and their contexts” 2007. Available at: [http://www.icn.ch/sew\\_awff\\_data\\_sum07.htm](http://www.icn.ch/sew_awff_data_sum07.htm). Accessed November 27, 2009.



### Wages for Professions in OECD Countries (ICN, 2007 Nurse Wages and Their Context)

Japan had 9.3 nurses per 1,000 population in 2006, slightly below the OECD average of 9.7 but above the US at 7.9.<sup>18</sup> The US is in the midst of extreme shortages in the nursing workforce that will reach staggering deficiencies of nearly 800,000 vacant positions by 2020 if the trend continues.<sup>19</sup> Also, it is projected that one in five US nurses plan to leave the profession due to being overworked, low wages and burdened with laborious manual paper work that makes them prone to error.<sup>20</sup> Some of the same difficulties getting the medical information necessary to coordinate care are perplexing the Japanese care managers who are the main proponents for coordinating care in the community for Japanese elders. These problems are causing many of the licensed professionals to leave the workforce creating yet more quality-of-care concerns regarding elders in Japan.<sup>21</sup>

Also, legislation in Japan allows for doctors now to select what national hospital they want to practice as opposed to being directed where to go by the medical school administration from where they receive their degrees. Most physicians prefer now to go to non-rural areas and hospitals with the better technology to support care. Even though citizens can go to any hospital in Japan, they often go to the local hospitals out of convenience, especially for elders who have limited mobility. For rural hospitals, lack of physicians in these hospitals adds to disparity in care.

### *Creating Social Security Reform and Using IT as a Vehicle*

<sup>18</sup> OECD Health Data 2007.

<sup>19</sup> Bureau of Health Professions. National Center for Health Workforce Analysis, Projected Supply, Demand, and Shortages of Registered Nurses: 2000-2020. July 2002.

<sup>20</sup> Bureau of Health Professions, 2002.

<sup>21</sup> Motoya T. System for care support based on factor structural analysis or burdens of care managers. *Hospital Administration*. Vol 42:1; 2005:29-39.

Japan's social reform initiatives entail creating a means to more effectively administer interaction between its citizens and publically funded institutions – in essence establishing e-government capability. This ability is increasingly important due to its need to more effectively care for the aging population that has become an overwhelming administrative burden.<sup>22</sup> The reform is necessary to transform the social infrastructure from the present model that evolved from the industrial society model of the 20th century into one suitable for a new information-oriented society where information and knowledge becomes the basis for added-value to social and economic prospects. The reform was first enacted in the 2001 and 2003 e-Japan strategy that aims to continue developing the IT infrastructure into one to support a revolution in information exchange and ultimately serve as an infrastructure for a citizen-centered healthcare/social security service utilizing interoperable IT.<sup>23</sup> An overview of the reform and its specific targets includes the following:

- Drastically reduce healthcare insurance administrative costs through the complete computerization and online processing of medical insurance claims no later than the beginning of FY 2011 and use databases of medical insurance claim information for epidemiological purposes to promote preventive treatment and reduce costs.
- Build by FY 2010 the foundations for using individuals' healthcare information throughout their lifetimes, supporting self management by individuals of their health conditions and efforts to maintain health.
- Promote remote healthcare to eliminate disparities in the level of healthcare among different regions including access to advanced treatments and employ terrestrial digital broadcasting to provide effective instructions and information to patients during emergencies.
- Clarify the objectives of the introduction and promotion of widespread use of healthcare IS including EMRs to enhance the quality of healthcare, ensure the safety of medical treatment and encourage greater collaboration among medical institutions.
- Promote comprehensive and effective computerization throughout the medical, healthcare, nursing and social welfare fields.

The reform is to be completely realized by 2011 with a National Information Infrastructure that allows every citizen to have a social security identifier that is used to track social insurance information, medical information and nursing services for elder care information. In other words, the Infrastructure would act as a pension book, health insurance card and nursing care insurance card to be used via a Web-interface accessing information repositories.

### **National EHR Program**

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<sup>22</sup> Akiyama Y. Office of Medical Devices and Information, Research and Development Division, Health Policy Bureau, Ministry of Health, Labor, and Welfare. Interviewed on: February 20, 2009.

<sup>23</sup> Japan IT Strategic Headquarters IT Policy Program 2008, Yamouchi 2008.

The National EHR program that Japan is actively pursuing is part of the aforementioned social services reform. Some major accomplishments in the history of this reform that directly relate to the EHR program are as follows:<sup>24</sup>

- **July 1974:** The Japanese MHLW and the Ministry of Economy, Trade, and Industry (METI) jointly established the Medical Information System Development Center (MEDIS-DC). The center conducts fundamental and comprehensive research, study, development and experimentation related to medical IS as well as promoting operations for the dissemination of their results and organizing staff training. Specifically, it is promoting the development of various master/code tables and undertakes approvals of privacy mark certifications in the healthcare field. It is also acting as one of the certification authorities for issuing electronic certifications in the healthcare field.<sup>25</sup>
- **June 1995:** The establishment of ¥800 million dedicated to research development for EMRs to be used within a single healthcare organization and the funding supported development with commercial vendors by the MHLW.
- **April 1999:** The EMR was authorized as a formal document requiring protection from theft or unlawful exposure as well as consent from the individual patient to all for the information to be retained and transferred to other medical personnel for review.
- **April 1994:** The Japanese Association of Healthcare Information Systems Industry (JAHIS) was established in April 1994 with the aim of promoting standardization of healthcare IS, improving the related technologies, and securing quality and safety. It has been continuing its activities for these aims with 343 corporate members as of May 1, 2008. Since FY2006, it has been participating in the Japanese METI's three-year project known as the "Healthcare Information System Interoperability Verification Program" and has made contributions to it under the following four themes of: (1) data compatibility; (2) system interconnectability; (3) system-common platform; and, (4) survey operations. JAHIS has succeeded in developing several standardizations including the radiation data interchange standard, prescription data interchange standard, disease name information data interchange standard, clinical examination data interchange standard and the guidelines for electronic storage of medical records that should result in mandatory conservation.
- **July 1998:** HL7 Japan is established as a the seventh overseas branch of the organization created in 1985 in the US as a voluntary, non-profit-making organization established in 1987 in the United States with the aim of promoting the development and dissemination of international standards for information interchange between medical information systems. The secretariat of HL7 Japan is positioned in the JAHIS. It develops activities for reflecting Japanese opinions on HL7 standards through its participation in international conferences, as well as disseminates and promotes HL7 standards in Japan by holding seminars and publishing journals.
- **May 2000:** The Health Information and Communication Standards Board (HELICS) is established in order to enable consistent activities among standardization institutions for the electronic conversion of information handled by healthcare IS, as well as to define the description formats including codes and storage formats. Its aims include discussions on

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<sup>24</sup> Tanji N. Trends in Healthcare Information Standardization. NEC; 2008. Available at: <http://www.nec.co.jp/techrep/en/journal/g08/n03/080316.html>. Accessed November 27, 2009.

<sup>25</sup> Tanji, 2008.

policy and the detailed content of standardizations, recommendations of the standard to be adopted for each purpose of use, and indications of guidelines for use of the standards.<sup>26</sup>

### HELICS Medical Information Standardization Guidelines

No.	HELICS Standardization Guideline Name
HS001	Standard Master for Pharmaceutical Products (HOT reference numbers)
HS002	Agreement on Clinical Laboratory Data Communication. JAHIS. Ver. 2.0
HS003	Agreement on Clinical Laboratory Data Communication. JAHIS. Ver. 2.0 <online>
HS004	DICOM Standards
HS005	ICD-10 Based Standard Disease Code Master for Electronic Medical Records, Ver. 2.30
HS006	Patient Referral Document & Clinical Data Document V.1.00
Under deliberation	Referral Document V1.0 (For Inter-Enterprise)
Under deliberation	IHE: PDI(Portable Data for Images) Integration Profile, and Its Application, Guideline

- **January 2001:** e-Japan Strategy aimed to make Japan the world's most advanced IT nation within five years and establish the IT infrastructure needed to provide broadband Internet connectivity via high-speed constant access networks to at least 30 million households and ultra high-speed constant access to 10 million households; this has resulted in the reduction of costs as illustrated by the cost of 100Mbps at US \$60 equivalent in 2007 down from 128Kbps at US \$350 in 1998.<sup>27</sup> This strategy has provided the basis of a possible healthcare IT infrastructure.
- **December 2001:** IT Grand Design for Healthcare included more funding and focus for standardization of health information with the goal of having one institution in every secondary medical area across Japan implement an EMR. Also, at least 60 percent of the hospitals should have at least an e-claim system for filing claims with the national healthcare insurance and have some components of EMR and CPOE.
- **January 2002:** The MHLW provided ¥20 billion to subsidize EMR development by national hospitals, but no standards were in place to ensure interoperability across the networks. The low percentage of hospitals that did use the funding are now trying to upgrade software and are in need of additional funding.
- **February 2003- 2007:** METI provided ¥25 billion for regional EHR development for sharing of medical records and data exchange between hospitals, clinics and nursing stations within a particular region (i.e., not for national exchange). The ¥1.5 billion for the “Interoperability of Health Information Systems Project by METI ...’04-’07” included the following:<sup>28</sup>

<sup>26</sup> Medical information Standardization Guidelines. Health Information and Communications Standards Board Website. Available at: <http://helics.umin.ac.jp/>. Accessed November 27, 2009.

<sup>27</sup> Kokuryo J. Professor, Faculty of Policy Management, Executive Director, Keio Research Institute, SFC, Director Incubation Center, Chairman of the IT Strategy Evaluation Committee. Interviewed on Jan 17, 2009.

<sup>28</sup> Kimura M. Healthcare IT standards Japan's Journey towards interoperability. Presentation at HL7 Conference. September 2008.



- Integrating the Healthcare Enterprise – Japan (IHE-J) provided activity support during an event titled “Connect-a-Thon” where installation support was given to a variety of vendors and IT showcased at Saitama Medical College Hospital;<sup>29</sup>
- Inter-EMR fundamental data set for system update/vendor change by JAHIS; and,<sup>30</sup>
- HL7 tools development.
- **Feb 2007:** The “Health Informatics - Electronic Health Record Communication” standard was established to define the archetype – the structure for isolating that part of the data that is directly concerned with clinical practice in traditional systems and for reflecting accurately the contents defined exclusively by clinical experts for changes in the clinical field . It is to be included in the EN 13606 standard for openEHR.<sup>31</sup> This standard is also under deliberation for international standardization at ISO to promote interoperability across EMRs and EHRs.

## National IT/ICT Status & Strategy

### *I. Extent to which primary care providers have access to and utilize a consistent set of patient information systems*

Despite efforts and goals to have EMRs usage in national hospitals and clinics and the e-filing of insurance claims to the national insurance system by 2011, most records are still manual across national hospitals. A February 2007 study found that only 10 percent of hospitals with more than 400 beds and 10.1 percent of clinics in Japan had implemented EMRs.<sup>32</sup> Yet another study found that, as of 2006, CPOE adoption was at 75 percent or more in the hospitals with more than 400 beds, 22 percent for EMR adoption in hospitals with more than 400 beds and five percent of for clinics.<sup>33</sup> While these numbers differ, the main inhibitor noted by both resources is cost of implementation. Under the reform plan, no more than three percent of expenses by hospitals and clinics to implement a vendor solution were subsidized by government subsidies, when at least 30 percent is more realistic.<sup>34</sup> The high vendor costs are attributed to lack of standards for what the EMR should include and how it should be formatted (i.e., too much customization).<sup>35</sup> The customization is being led by physician preferences and the need for vendors to tailor each solution to each hospital's own workflow, both of which differ greatly at each hospital.<sup>36</sup>

The need for business process reengineering to streamline workflows will be the catalyst for enabling a solution that can be applied across hospitals driving costs down. Because of this high

<sup>29</sup> Integrating the Healthcare Enterprise – Japan Website. Available at: <http://www.ihe-j.org/en/>. Accessed November 27, 2009.

<sup>30</sup> Iwata M. Japan Association of Health Information Systems. Industry security design for electronic medical record from the Ministry of Health and Welfare Report on electronic medical record R&D. Abstract of the 16th Medical Information Study-group General Meeting Panel Discussion. November 1996.

Available at: <http://www.jahis.jp/english/other-information/topics08.htm>. Accessed November 27, 2009.

<sup>31</sup> OpenEHR Website. Available at: <http://openehr.jp/>.

<sup>32</sup> Yasunaga H, Imamurab T, Yamakic S, Endod H. Computerized medical records in Japan. *International Journal of Medical Informatics*. Vol 77. March 2008:708-713.

<sup>33</sup> Kimura, 2008.

<sup>34</sup> Kimura, 2008.

<sup>35</sup> Kimura, 2008.

<sup>36</sup> Kimura, 2008.

degree of customization, there is no single EMR vendor solution applied across all hospitals. Each hospital or clinic has discretion as to what vendor solution they provide; yet no vendor solution has been approved by the committees of the IT Strategy Evaluation System (sanctioned by the IT Policy Office of the IT Headquarters in Japan). This committee requires that each hospital must ensure that they are able to *secure* their data contained in the EMR and that any regional EHR initiatives are highly secured. However, confirmation to specific standards noted by HL7, HELICS and other internationally recognized standards entities on which the vendor solution is created is not mandated but rather highly encouraged. In other words, no penalties are charged if the vendor solution does not conform but there is a policy of public humiliation and possible malpractice suit if the hospitals system is compromised.

### ***Availability of Broadband and High-speed Internet Services***

During the past five years since the e-Japan Strategy was first unveiled, Japan has become an advanced IT nation. The results achieved have included the following:<sup>37</sup>

- Second leading number of Internet hosts behind the US;
- Advanced high-speed broadband infrastructure capable of handling needed healthcare information transfer within the metropolitan areas. Japan's broadband users numbered 20.9 million, representing the world's third largest behind the US and China in 2006;
- Ranked third after the US in mobile phone users the world's leading 2006 estimate; and
- Ranks third behind the US and China in e-commerce expansion as of 2008.<sup>38</sup>

Therefore, Japan possesses the necessary broadband and high-speed Internet services to support connectivity to Web-enabled healthcare IT.

### ***Extent to which IT/ICT is utilized for connectivity between healthcare providers and payers (national and private)***

In late 2005, the Japanese government started encouraging online processing for medical bill claims as all medical institutions are being required to convert to the online claim system by 2011. Projects began in 2006 included more than 12 large national hospitals and their regional screening and payment institutions. The subsidy from the government includes ¥30 Yen (about US \$0.25) per medical bill claim to each medical institution as an incentive to use the online system. However, the incentive applies only to institutions that use the online system along with some other HIT system.<sup>39</sup>

### ***Extent that standard healthcare transactions are in place and which standards are of greatest use***

Japan's IT Strategy Headquarters promotes the use of uniform health information standards, including a common medical language. SNOMED CT is considered the standard for medical terminology covering most areas of clinical information (e.g., the diseases, findings, procedures

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<sup>37</sup> According to CIA Worldbook Data 2006 -2008.

<sup>38</sup> OECD Country Data 2008.

<sup>39</sup> Shimoda and Kondo 2007.

and microorganisms) and used for organizing the content of medical records to reduce variability in data capture. HL7 standards and HELICS versions of standards are sanctioned for exchange, integration, sharing and retrieval of electronic health information.<sup>40</sup> Also, DICOM is the accepted standard for handling, storing, printing and transmitting information in medical imaging.<sup>41</sup>

## **National/Regional EHR Approach**

The nationally promoted strategy is actually for regions to develop an EHR or interoperability of the individual EMRs that could connect the various hospitals or clinics within the same region. In 2003, METI had allocated ¥2.6 billion for 26 RHIO-like Regional Health Record Interchange initiative; however, only a few are surviving now because the METI offered a one-time payment only, no sustainable cost was budgeted and each mostly used the funding to improve their core HIS as opposed to actual interoperability.<sup>42</sup> One survived with success relative: the Shizuoka Prefecture – a regional area consisting of cities and townships about an hour and a half southeast of Tokyo with a population of 3.8 million and 183 hospitals (20+ beds) – is being promoted by the MHLW as a national model for how regional EHR projects should be orchestrated. While the EHR is not as comprehensive in functionality as typically expected, functionality is growing. For example, the initial vision was to consult with one vendor to create an EHR for all hospitals in the prefecture to share. However, at the time all of the hospitals had CPOE programs that were by different vendors and the vendors wanted nearly ¥40 million just to convert the CPOE functionality from all the different vendors into one standard CPOE. Therefore, this functionality was left out of the original solution. Lab results, images and PxDB, and referrals were deemed to be feasible functions to include in the EHR in 2003.

By 2006, the MHLW had invested ¥88 million in the Shizuoka Prefecture EHR project to improve its HISs including the ability to create capabilities for progress notes; nursing observations; more electronic referral documents; clinical research database; the PACsystem; prescriptions from CPOE in HL7 v2.5 format; and other formatted medical documents for use across the different hospitals and clinics in the prefecture as well as provide connectivity to a gateway to access the EMR.<sup>43</sup> Users are authorized based on their credentials as a provider or clinician recognized by the Shizuoka prefecture and given an Enterprise User Authentication ID to access the gateway. Shizuoka prefecture hospitals access the EHR free-of-charge and providers can download patient data to CDs that they can then provide to patients and collect a ¥3,000 fee, thus enabling them to generate commerce. While there are no PHR components, the MHLW did approve the selling of the patient data CDs to the patients only if the data comply with the recommended HL7 and DICOM standards.<sup>44</sup> Thus, if the patient leaves the prefecture and seeks care elsewhere, the data complies with accepted standards, thereby increasing the likelihood that it can be read or consumed by other software. The resulting architecture is as follows:

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<sup>40</sup> Shimoda and Kondo 2007.

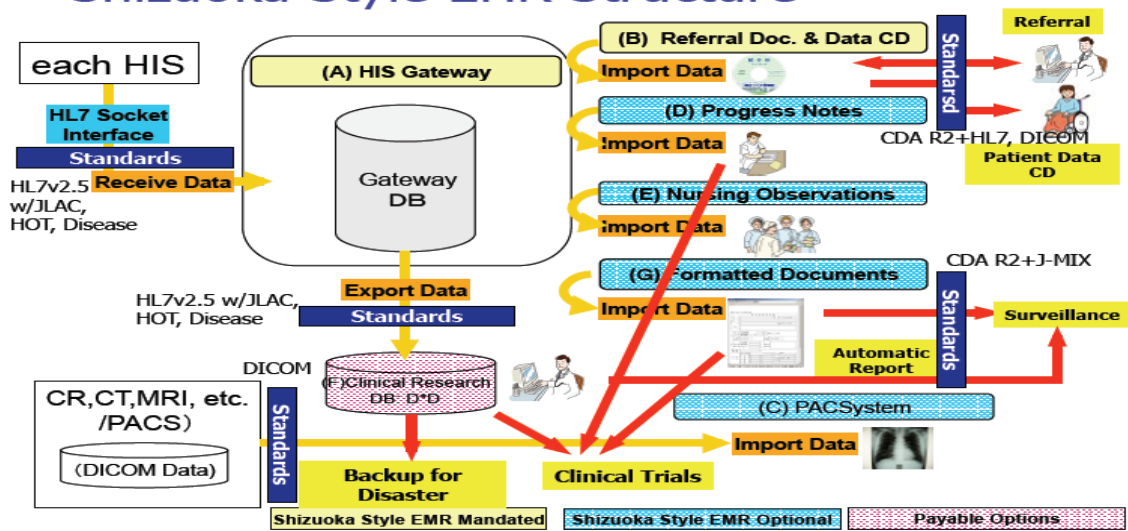
<sup>41</sup> Kimura M.Hamamatsu University Hospital, Department of Medical Informatics, HL7 Japan chair (2004-2009), IHE Japan Board ISO TC215(Health Informatics) WG2 vice convener, Vice president of Japan Assoc. for Medical Informatics. Interviewed on February 17, 2009.

<sup>42</sup> Kimura 2008 and 2009.

<sup>43</sup> Kimura 2008

<sup>44</sup> Kimura 2008.

## Shizuoka Style EHR Structure



### Shizuoka Prefecture EHR (Kimura 2008)

Part of the Shizuoka EHR is Standardized Structured Medical Information eXchange (SS-MIX).<sup>45</sup> The Shizuoka Prefecture Style EHR appears to be more aligned with category #4, the Integrated EPR.

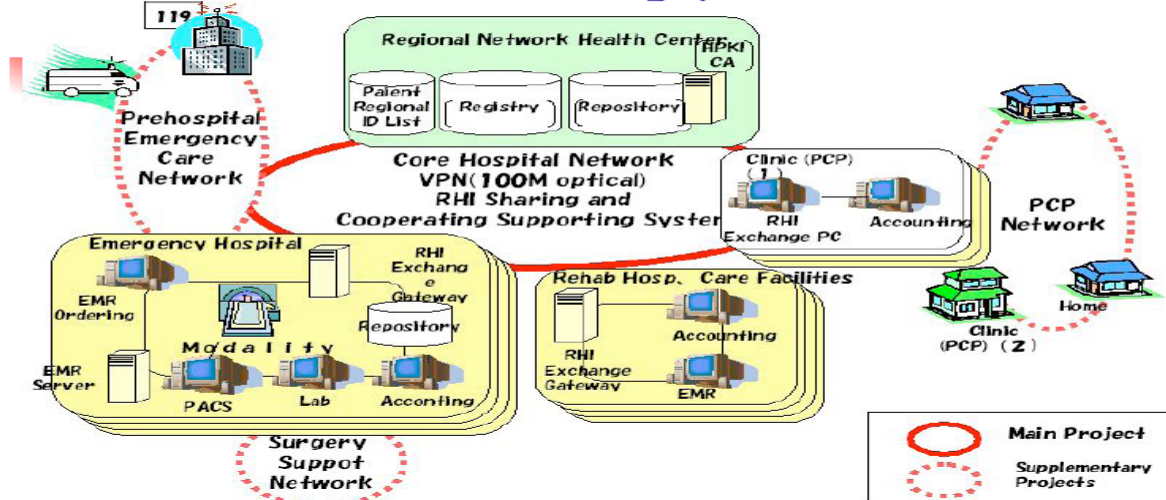
To promote regional adoption of EHR solutions such as the Shizuoka Prefecture model and HIE in Japan, the ministries have provided funding and projects to be governed by IHE-J HP.<sup>46</sup> The MLHW budgeted for US \$1 million equivalent in 2007 for development of an interoperability testing tool. METI has budgeted US \$2 million equivalent for an interoperability project for 2007-2009. One primary project entailed 36 vendors testing 72 systems to access, upload and download data for radiology, laboratory and cardiology with the Shizuoka EHR via the gateway in 2007. This effort was known as the Japan Connect-a-thon. In 2008, 40 vendors participated testing 86 systems.

Another regional HIE system in Nagoya (consisting mainly of four emergency hospitals and three rehabilitation facilities) has been developed on the Shizuoka model, specifically for sharing the same type of information as the data transmitted via the Shizuoka EHR to care for stroke victims in the region.

<sup>45</sup> Kimura 2008.

<sup>46</sup> Integrating the Healthcare Enterprise – Japan Website.

## Network Structure of RHIE System for Stroke Care in Nagoya



### RHIE for Stroke Care (Kimura 2008)

Another notable success in IHE in Japan is by Hamamatsu University Hospital. Together with Toshiba CT, Fuji RIS sends information to the NEC HIS that shows scheduling and progress of examinations for patients as “not arrived,” “not examined,” or “examination finished.”

## EHR Governance

### Legal/Regulatory

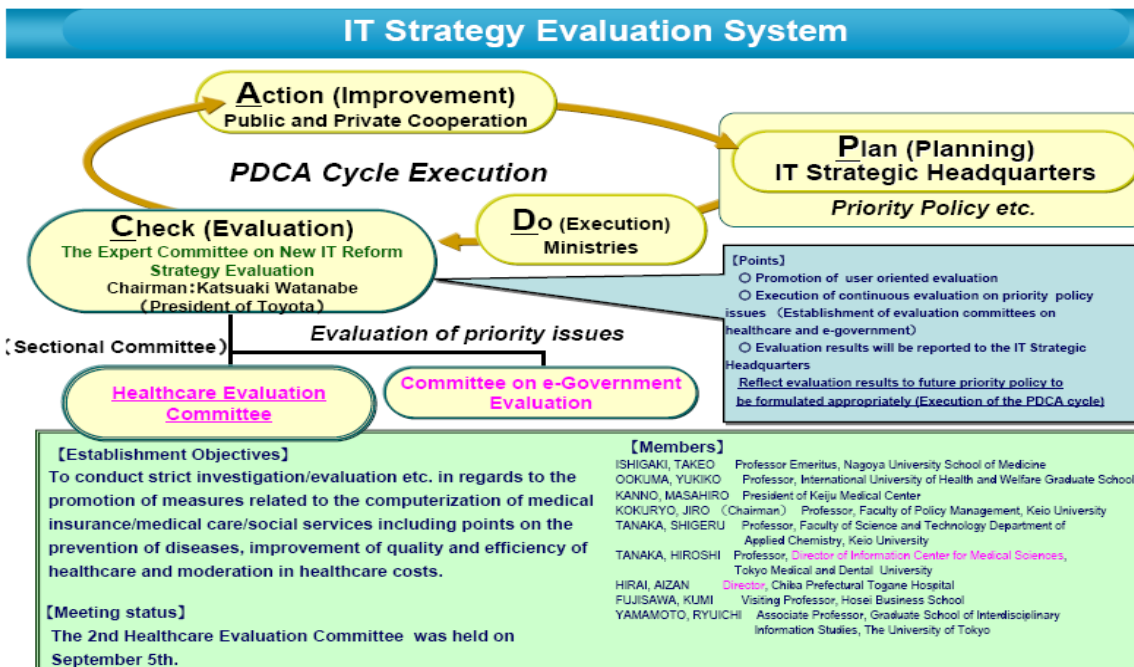
There is an overarching body guiding the developments of the EHR strategy in Japan. The IT Strategic Headquarters is chaired by the Prime Minister and its primary council is comprised of several ministries (Minister of State for Science and Technology Policy; Minister of Internal Affairs and Communications; and Minister of Economy, Trade and Industry). Members of the Headquarters are tasked with implementing policy (as directed by the IT Policy Office of the Headquarters) and allocating funding from the MHLW mainly, but all other ministries are represented. Other members that advise the council are prefectural political members, professors from leading academic institutions, and executive leadership from major corporations such as Toyota and NTT DoCoMo.<sup>47</sup>

### Healthcare Policy

Because virtually all activity of the IT Strategic Headquarters entails healthcare or e-government activities, an IT Evaluation System for reviewing plans and actions is in place to review and approve direction and projects. It is comprised of committee members from industry, academia, physician leadership from the Japan Medical Association, and administrators from healthcare organizations. The IT Evaluation System publishes guidance under the Japanese Industrial Standards Committee (part of METI), which is Japan’s International Organization for

<sup>47</sup> Yamouchi 2008.

Standardization (ISO) equivalent. The structure of the evaluation system is reflected in the following:



### IT Policy Evaluation System (Yamauchi 2008)

While there is an abundance of activity exploring implementation and use of EHR, the autonomy of the ministries does present complexity in how projects are funded, supported and governed. There are no mandates for hospitals to employ EMR, no hard mandate for regional EHR development, and no consistent funding or incentives for implementation as in the US with the recent IT reform policies.

### Technology

In summary, the primary EMR/EHR components being employed in the examples provided for implementations in Japan are as follows: progress notes, nursing observations, electronic referral documents, clinical research downloads and inquiries, image and audio file transfer, and e-prescriptions from CPOE. There is more emphasis on projects promoting e-prescribing, which is increasingly becoming part of the regional EHR initiative in Japan.<sup>48</sup>

According to Project Manager for the – PAN Asian Evidence-based e-Health Adoption (PANACeA), there were more telemedicine projects underway in Japan as of 2007 (35 percent of total telehealth activity) than in any other Asian country.<sup>49</sup> This is due to the vast aging population that may be isolated geographically from hospitals in rural areas or immobile, as well as people such as single parents who have limited time to seek care in the socialized medical

<sup>48</sup> Akiyama, 2009.

<sup>49</sup> Khoja S. Opportunities in telehealth. 2007. Available at <http://www.u21health.org/meetings/hongkong2007/docs/conference/telehealth-Asia.pdf>. Accessed November 27, 2009.

system that is marred by excessive wait times.<sup>50</sup> Teleradiology is expected to be the most prevalent form of telemedicine in Japan;<sup>51</sup> given the fact that HL7 Japan is being led by leading radiologists such as Dr. Michio Kimura, this predication is likely to come true. Activities in telemedicine are typical of those stipulated by the Telemedicine Society of Japan and the American Telemedicine Association include the following:

- Specialist referral services typically involve a specialist assisting a general practitioner in rendering a diagnosis. This may involve a patient “seeing” a specialist over a live, remote consult or the transmission of diagnostic images and/or video along with patient data to a specialist to review at a later time.
- Direct patient care such as sharing audio, video and medical data between a patient and a health professional for use in rendering a diagnosis, treatment plan, prescription or advice. This might involve patients located at a remote clinic, a physician’s office or home.
- Remote patient monitoring uses devices to remotely collect and send data to a monitoring station for interpretation. Such home telehealth applications might include using telemetry devices to capture a specific vital sign, such as blood pressure, glucose, ECG or weight. Such services can be used to supplement the use of visiting nurses.
- Medical education and mentoring that range from the provision of continuing medical education credits for health professionals and special medical education seminars for targeted groups to interactive expert advice provided to another professional performing medical procedure.
- Consumer medical and health information includes the use of the Internet for consumers to obtain specialized health information and online discussion groups to provide peer-to-peer support.

Delivery mechanisms are also typical as indicated by both of the telemedicine societies such as:

- Remote healthcare relies of several means for the delivery of data.
- Networked programs link tertiary care hospitals and clinics with outlying clinics and community health centers in rural or suburban areas through either hub-and-spoke or integrated networked systems. The links may use dedicated high-speed lines or the Internet for telecommunication links between sites. It is estimated that there are about 200 telemedicine networks in the US involving close to 3,500 medical and healthcare institutions throughout the country. In Japan, there are more than 348 projects, with 37 percent that are teleradiology-oriented.<sup>52</sup>
- Point-to-point connections using private networks are used by hospitals and clinics that deliver services directly or contract out specialty services to independent medical service providers at ambulatory care sites.
- Health provider to the home connections involve connecting primary care providers, specialists and home health nurses with patients over single line phone-video systems for

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<sup>50</sup> Kokuryo, 2009.

<sup>51</sup> Hasegawa and Murase 2007; Telemedicine and e-Health, 2008. Available at: [http://www.telemedicinealerts.com/Archives/2008/March\\_08/mar14\\_08.htm](http://www.telemedicinealerts.com/Archives/2008/March_08/mar14_08.htm). Accessed November 27, 2009..

<sup>52</sup> Hasegawa and Murase, 2007.

interactive clinical consultations. Such services can also be extended to a residential care center such as nursing homes or assisted living facility.

- Direct patient to monitoring center links are used for pacemaker, cardiac, pulmonary or fetal monitoring and related services, providing patients the ability to maintain independent lifestyle.
- Web-based e-health patient service sites provide direct consumer outreach and services over the Internet.

However, one main problem exists in Japan: there is a severe lack of automation to assist care managers in gathering information and coordinating care by auxiliary services for home care patients in Japan.<sup>53</sup> The healthy living and homecare support activities that are coordinated by the community care providers are left out of the information loop provided in the aforementioned networks. The care coordinators are not hospital employees and thus do not have access to medical information unless the physician provides it to them. They require some medical information as well as a means to more efficiently manage the information collected by the auxiliary care providers that service patients. This information is cumbersome to collect and maintain for the great number of patients assigned to one care coordinator. Projects for creating telemedicine type networks for this faction are underway in Japan because they are critical to how well the patient is able to conform to a physicians prescribed regimen in the home care setting –the type of setting that both Japan and the US are actively trying to push care towards for manageable disease maintenance.<sup>54</sup> Efforts for using technology for telemedicine are not as widespread in the US. There are pockets of communities applying telemedicine technology; for basic home care, however, these technologies are lacking the accessibility of the EMR in a home setting for care givers if needed.

## **Adoption**

As noted earlier, a February 2007 study found that only 10 percent of hospitals with more than 400 beds and 10.1 percent of clinics in Japan had implemented EMRs.<sup>55</sup> Other adoption rate data are as follows:

### **Adoption Rates**

As of 2006, CPOE system adoption for hospitals with more than 400 beds was at 75 percent or more, 22 percent for EMR adoption in those hospitals and 5 percent for clinics.<sup>56</sup> Another study for hospitals and clinics that did not adopt EMR found that the following reasons apply:<sup>57</sup>

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<sup>53</sup> Uchiyama E. Researcher, Keio Research Institute, eCare Lab. Discussed the development of an information system to house care data to support care managers and home health for patient. Interviewed at various times between Nov 2009 and present.

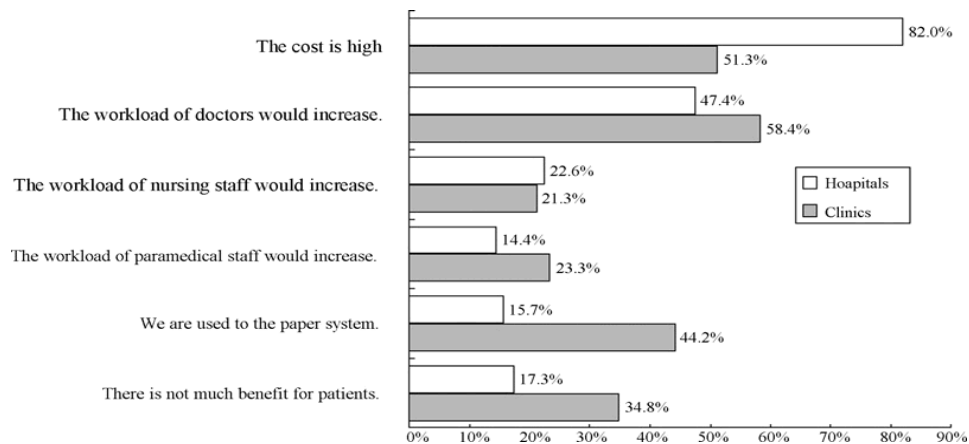
<sup>54</sup> Uchiyama, 2009.

<sup>55</sup> Yasunaga, 2008.

<sup>56</sup> Kimura, 2008.

<sup>57</sup> Yasunga, 2008.





## Reasons for Not Adopting EMRs

Yet another study found the following problems impacting adoption:<sup>58</sup>

### Challenges to EMR/EHR Adoption

Challenges	Solutions
Few IT experts in Japanese hospitals. This shortage is due to the late adoption of IT in these institutions as well as to a tight labor market for computer engineers in the country. As a result, Integrated Hospital Information Systems and EHRs tend to be integrated by single vendors outsourced by hospitals.	METI hopes to institute policies that put into place skilled Chief Information Officers (CIOs) in hospitals and improve IT competency throughout the hospital.
Difficulty networking hospitals and clinics. No standards exist for paper medical records, nevermind EHRs. As a result many uninteroperable versions of customized EHRs with identical functions exist.	The Ministry of Health, Labor and Welfare and METI are trying to coordinate medical services and patient information sharing among hospitals and clinics in each region.
Heavy focus on late-stage disease rather than early health. In general, a healthy person does not focus too much on health issues until the onset of illness.	Society must incentivize healthy behaviors and a proactive approach to health. Health education from an early age is critical in this regard.

In the future, PHRs are expected to be used to help patients, their caregivers and family members remain aware of their conditions and provide details to patients about social networking opportunities to communicate with other patients. The Japanese government is stressing the importance of each citizen taking more responsibility in managing their own health and more requirements of the employers to track the healthiness of its employees. The government is making strides in discussion about how PHRs are used and secured, but it is believed that the onus should not be on the patient to educate the provider about their pre-existing conditions if the patient moves from one provider to another.<sup>59</sup> PHRs should rather be a means for the patient to educate themselves about their own condition and not a tool for the patient to educate the

<sup>58</sup> Shimada and Kondo, 2007.

<sup>59</sup> Kimura, 2009.

practitioner.<sup>60</sup> The IT Policy Office in Japan does indicate that PHRs tethered to EHRs be evaluated for safeguards, data integrity and accountability issues, but cost of adoption of the EHR precludes development of the tethered PHR. However, privacy of personal information is an issue in Japan and the US that has some people hesitant about using commercial products such as Google Health and Microsoft HealthVault, or even PHRs tethered to an EHR that is made available by employer-sponsored healthcare insurance plans.<sup>61</sup> The fear of this tethered PHR is that employers would have access to employee health information that could be used to as a means to discriminate based on health status for insurance benefits or employment advancement. However, PHRs are not currently introduced as part of EMR or EHR implementations.<sup>68</sup> The main inhibitor is lack of adoption of the EMR or EHR to facilitate data for a proprietary PHR or extraction into an external commercial PHR. Japanese medical informatics researchers, government entities and businesses are eager to learn about when MS HealthVault or Google Health will be available in Japan, was access to these sites was discussed by various speakers as a need for Japan at the 28<sup>th</sup> Conference on Medical Informatics sponsored mainly by JAMI in November 2008.

Cost remains as the major inhibitor to adoption of EMRs and thus the adoption of a tethered PHR. Typical costs for an EMR for a 250+ bed hospital in Japan is as follows:<sup>62</sup>

- ¥44 million: Network
- ¥94 million: Hardware, Database, Middleware
- ¥44 million: CPOE and Claim software package
- ¥25 million: Installations, Meetings, Settings
- ¥75 million: Customization (workflow tailoring, program customization)
- ¥31 million: Additional hardware for EMR
- ¥19 million: EMR software package
- ¥31 million: Installations, Meetings, Settings
- ¥31 million: EMR customization

The hospital must fund these implementations themselves, unless they are able to get government subsidies. In general, however those subsidies have been minimal in scale. Unless the government subsidizes increase, or vendors are willing to partner and offer solutions at lower prices, EMR adoption will not flourish.<sup>63</sup>

## Outcomes and Benefits

CPOE implementations have had the most documented success for clinical outcomes in terms of less omitted claimable examinations/interventions because of being able to document at the point-of-care; less patient waiting time due to decrease in manual documentation to create instructions or discharge information; and less likelihood of miss-read prescription.<sup>64</sup>

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<sup>60</sup> Kimura, 2009.

<sup>61</sup> Kokuryo 2009, Halamka J. Chief Information Officer, Harvard Medical School. Key note speaker at Fujitsu EMR/PHR Conference. Interviewed on February 10, 2009.

<sup>62</sup> Kimura, 2008.

<sup>63</sup> Tanaka and Kimura, 2009.

<sup>64</sup> Kimura, 2008.

Studies have shown that effectiveness of EMR in hospitals is mostly associated with “information sharing between healthcare workers” for which 86.8 percent of the healthcare facilities that implemented indicated as the main benefit. This was followed by “time efficiency of pharmaceutical services” at 63.2 percent, “time efficiency of testing” at 60.8 percent, “time efficiency of physicians” at 25.2 percent, and “inter-hospital networks ” for regional implementation at 49.3 percent.<sup>65</sup>

## Implementation Experiences

In 2006, METI stopped subsidizing about half of the 12 pilot EMR/EHR projects in various regions of Japan only one year after the projects started. This was a major setback for national HIT adoption in Japan.<sup>66</sup> As far as some socio-technical issues influencing acceptance, nurses and physicians like the idea of being able to have the comprehensive data available, but they tend to spend too much time going through the data and that it is not presented in a manner that is easy and quick to digest. This slows them down in caring for patients.<sup>67</sup> In addition, physicians fear that they will be held to a higher standard because the comprehensive information *is* available: if they miss some pertinent detail that could impact diagnosis, they are more accountable in the event of negative outcomes (i.e., more likely to be sued).<sup>68</sup> Fear of transparency that could lead to more scrutinizing of personal practices deters physicians from encouraging their hospitals or their practices from converting to EMRs.

## Next Steps

Academics and healthcare professionals note the lack of focus by the government on incentives – not only for continuance of large hospitals to implement EMRs or a regional EHR, but the smaller hospitals that have been totally neglected despite accounting for 90 percent of all hospitals in Japan.<sup>69</sup> Focus should be here in providing subsidies and incentives for implementation as well as on incentivizing vendors to provide interoperable solutions. Other areas for future development include automating community pharmacies with the ability to access prescriptions electronically and improving work conditions for care managers in community-based care, automating their processes and allowing more streamlined access to needed medical information.

Another major issue is attending to changing the culture of organizations and their reliance on the paper chart. Methods for promoting behavioral acceptance of the technology include putting IT leadership into place in hospitals, followed by hiring personnel to train medical staff to use the technology effectively and incorporate it into the care process (i.e., change the workflow and etiquette for its use to not impede the patient care process). This will help EMR to be perceived as a helpful tool rather than a burden. Also, it should be advertised to patients that EMR is a

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<sup>65</sup> Yasunga, 2008.

<sup>66</sup> Shimada and Kondo, 2007.

<sup>67</sup> Kimura, 2009.

<sup>68</sup> Kimura, 2009.

<sup>69</sup> Yasunga, 2008.

device that can be used by the care provider to better care and educate the patient about their conditions.

A critical look at more effectiveness measures needs to be conducted to see how these systems are impacting quality and safety, not just efficiency measures (i.e., track the impact on medical error reduction in terms of reduction in adverse drug events because of access to allergy information more readily and reduction in length of stay). The studies referenced do not mention quality metrics. This may be attributed to an aversion to being transparent about effectiveness for fear of admitting error or incompetence.

Other business ventures to provide private health services in Japan are increasing for those who can afford to pay for services or for employers who are required by law to provide health checkups for their employees and need to outsource this activity. Despite Japan having better health statistics internationally, its citizens are somewhat dissatisfied with the pains of public healthcare such as extended wait times for appointments and needed surgeries.<sup>70</sup> For example, Johns Hopkins Hospital partnered with Resorttrust and Mitsui Fudosan (Japan's largest property developer) to develop a state-of-the-art medical clinic, the Tokyo Midtown Medical Center, to service those with willing to pay for services and thereby fill the gaps left by public health in providing timelier and more technologically advanced care.<sup>71</sup> Care is facilitated through on site care and video-conferencing with Johns Hopkins physicians. The IT includes use of CPOE, an EMR for a comprehensive log of care at the clinic, as well as electronic referral and scheduling with Johns Hopkins physicians and referrals for care in Baltimore. Private health is increasing in demand from the 1.4 million millionaires living in Japan, especially as they grow older and require more services that are better than economy class offered through public healthcare.<sup>72</sup> This trend, as well as ventures between US EMR solution vendors, are likely to increase in the future and will also introduce more use of EMRs and EHRs regionally to support sharing information among these private care clinics.<sup>73</sup>

Continuation of involvement between international standards committees and their counterparts in Japan will increase the likelihood of interoperable data transfer between the current and future EMR implementations.<sup>74</sup> However, the likelihood of mandate for use of one nationally approved EMR system is highly unlikely.<sup>75</sup>

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<sup>70</sup> Matsuyama K. US hospitals tackles Japan health care ills. *International Herald Tribune*. Anoko; April 2007.

<sup>71</sup> Toyko Midtown Clinic. What is Johns Hopkins? Available at: <http://www.tokymidtown-mc.jp/en/jhi.html>. Accessed November 27, 2009.

<sup>72</sup> Matsuyama, 2007.

<sup>73</sup> Furukawa K. Professor Emeritus Keio University. Discussed policy for US/Japan business relations. Interviewed on February 12 2009.

<sup>74</sup> Halamka 2009, Hammond W. Professor Emeritus/School of Medicine, Duke University Medical Center, Adjunct Professor, Fuqua School of Business, HL7-US Director, Key Note Speaker, HL7- Japan Conference. Interviewed on February 20, 2009

<sup>75</sup> Wada, Takashi Deputy Counsior, Information Technology Policy Office, Cabinet Secretariat, Government of Japan (Interviewed on February 20, 2009).

Japanese companies are internally known for offering high-quality technology products. Yet, the adoption of these products for domestic uses, especially in healthcare and in management of governmental resources, is surprisingly lacking.

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## **About the Contributor**

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## REPUBLIC OF KOREA (SOUTH KOREA)

### Overview of Country Healthcare System

#### *Quick Facts* <sup>76</sup>

- Population (July ,2008 estimate): 48,379,392
- GDP (2007 estimate): US \$1.206 trillion
- GDP per capita (2007 estimate): US \$25,000
- General Government Expenditures on Health (% of GDP – 2006): 11.9 percent<sup>77</sup>
- Internet Users (2007): 35.59 million

South Korea's healthcare system is characterized as a public healthcare system where medical services and care are provided by the state. The state provides financing for individual medical care through the National Health Insurance (NHI) system or the Medical Aid program. By the end of 2007, 96.3 percent of the population in South Korea was covered by NHI.<sup>78</sup> The NHI is under the responsibility of the Ministry of Health, Welfare and Family Affairs (MOHWFA) and administered by the National Health Insurance Corporation. Funding for the NHI is mainly from employee and employer contributions as well as government subsidies. Hospitals are usually privately run, with very few run by the state. The NHI pays the private providers a set rate for medical services.

### National EHR Program

#### *National IT/ICT Status & Strategy*

South Korea has one of the highest Internet adoption rates in the world, with 74 percent of the population identified as Internet users.<sup>79</sup> In 2005, nearly 90 percent of the households in South Korea had access to broadband Internet, the highest penetration rate in the world.<sup>80</sup> South Korea is widely known as a technology superpower and is home to many of the world's leading technology companies. Extensive ICT infrastructure and high rates of population adoption of technology leave South Korea in a position to easily adopt and implement e-health programs and services.

#### *National/Regional EHR Approach*

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<sup>76</sup> A World Fact Book. Central Intelligence Agency Website. Available at <https://www.cia.gov/library/publications/the-world-factbook/index.html>. Accessed November 27, 2009.

<sup>77</sup> World Health Organization Statistical Information System. Available at: <http://www.who.int/whosis/data/Search.jsp>. Accessed November 27, 2009.

<sup>78</sup> Republic of Korea. World Health Organization: Regional Office for the Western Pacific. Available at: [http://www.wpro.who.int/countries/2008/kor/national\\_health\\_priorities.htm](http://www.wpro.who.int/countries/2008/kor/national_health_priorities.htm). Accessed November 27, 2009.

<sup>79</sup> CIA World Fact Book.

<sup>80</sup> Global Technology Forum. Doing e-business in Korea. Available at: [http://globaltechforum.eiu.com/index.asp?layout=newdebi&country\\_id=KR&title=Doing%20e-business%20in%20South%20Korea](http://globaltechforum.eiu.com/index.asp?layout=newdebi&country_id=KR&title=Doing%20e-business%20in%20South%20Korea). Accessed November 27, 2009.

The national strategy of e-health in South Korea is outlined under the MOHWFA's National Health Information Network (NHIN) strategic plan. The MOHWFA established a five-year plan to develop the NHIN that includes: implementation of interoperable EHRs in public healthcare institutions and facilitating their adoption among private healthcare organizations; developing national services through infrastructure for health information sharing; and developing the infrastructure and governing structure for the NHIN.<sup>81</sup>

With regards to EHRs in the NHIN plan, the MOHWFA established the Center for Interoperable EHR (CiEHR)<sup>82</sup> to lead the establishment of EHR in Korea. In order to achieve the goals of having interoperable EHRs, the CiEHR is charged with the development of EHR architecture, terminology standards, knowledge bases and standards for EHR functional certifications.<sup>83</sup>

The NHIN falls under the responsibility of the MOHWFA, but will be implemented and developed by a number of different organizations, including: CiEHR, National Health Information Standard Committee and NHIC.<sup>84</sup>

Currently, the many different private medical facilities and providers in South Korea have adopted some form of a HIS, usually involving EHRs and an image sharing/storage program.

NHIN architecture<sup>85</sup> is the business and technical framework of NHIN and the specification of functions enabling the exchange of health information similar to the Blueprint of Canada Health *Infoway*. NHIN architecture describes how NHIN programs are collaborating and working for HIE and EHRs. Healthcare organizations and vendors following NHIN architecture will be able to join NHIN and access national health information.

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<sup>81</sup>Kim Y. National Health Information Network Development in Korea. Asia Pacific. Association for Medical Informatics. 2006. Available at: [http://www.apami.org/apami2006/papers/2006\\_APAMI\\_yoonkim.pdf](http://www.apami.org/apami2006/papers/2006_APAMI_yoonkim.pdf). Accessed November 27, 2009.

<sup>82</sup> Human Rights Korea Website. Available at: [www.hrkorea.org](http://www.hrkorea.org). Accessed November 27, 2009.

<sup>83</sup>Accenture. *The White Paper on China's Hospital Information Systems*. CHIMA. May 2008. Available at: [http://www.chima.org.cn/pe/DataCenter/UploadFiles\\_8400/200812/20081219115545203.pdf](http://www.chima.org.cn/pe/DataCenter/UploadFiles_8400/200812/20081219115545203.pdf). Accessed November 27, 2009.

<sup>84</sup>Kim, 2006.

The Republic of Korea model is shown below:

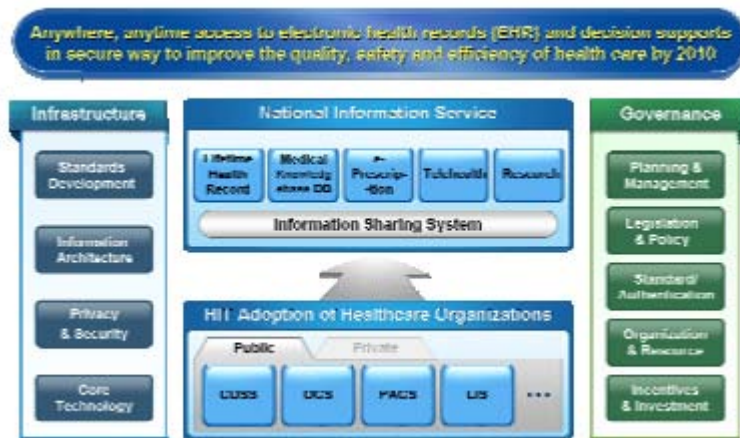
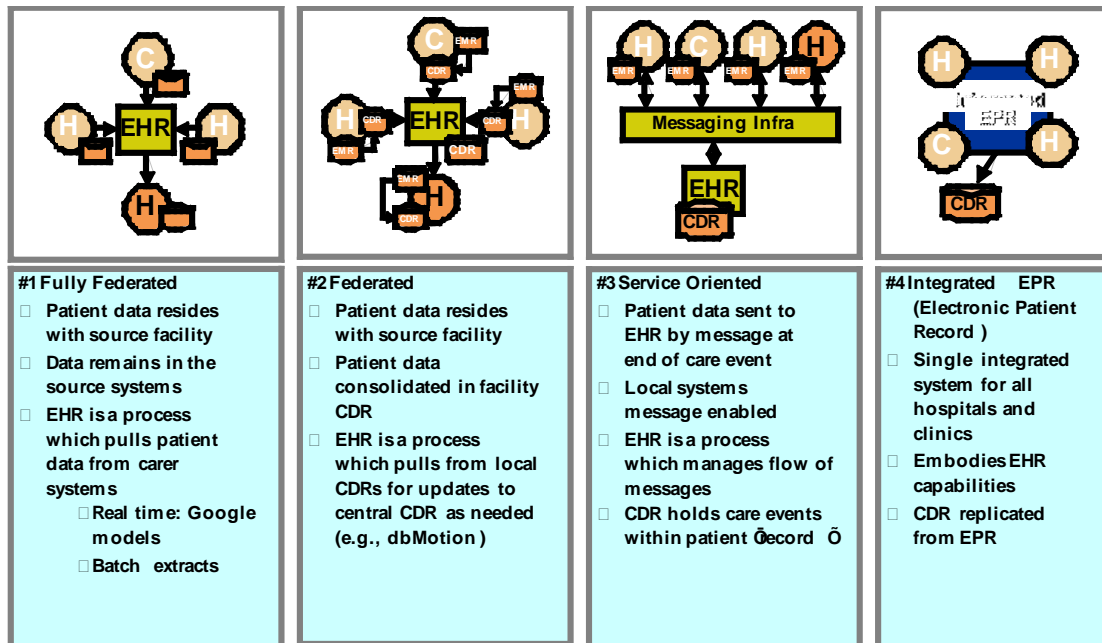


Figure 1 Korean NHIN Model

This architecture is represented as category #3, Service Oriented in the models below:



NOTE: EHR is a service not just a data repository i.e. does processing; further details provided in the next slides.

## E-Health Applications and Services Overview

A the majority of healthcare institutions in South Korea are private and utilize many different e-health systems. Below is just a sample of some projects and systems currently being used and implemented:

Program/Service	Description	Partners	Status
HealthKorea.net <a href="http://www.healthkorea.net">www.healthkorea.net</a>	Opened in 1998, HealthKorea.net is a cyber hospital operated by the company Medidas. The site operates by collecting medical information on a patient and then linking it into the site where it will be reviewed by doctors from around the country.	Medidas	Ongoing
Seoul National University Bundang Hospital (SNUBH) <a href="http://www.snubh.org">www.snubh.org</a>	SNUBH utilizes some of the most advanced e-health systems and processes currently available. The hospital utilizes an EMR system as well as digital medical treatment systems and telemedicine. SNUBH is a pilot hospital for the CiEHR's national health information system.	Seoul National University Bundang Hospital, Center for Interoperable EHR	Ongoing

## EHR Governance

### *Legal/Regulatory*

Article 17 of the Constitution of the Republic of Korea determines that a citizen's personal information is private and protected, and that each civilian has the right to control their own personal information. In order to protect citizen's personal information, the Government of Korea set-up the Korea Information Security Agency (KSIA) with the mission of: *a safe and reliable information society through the development and support of information security-related technology, as well as in-depth policy research on enhancing information security.*<sup>86</sup> The KSIA monitors IT security in Korea, as well as researches new methods for protecting personal information and provides advice and direction to the government.

Beyond the activities of the KSIA, the government has enacted a number of acts that govern the collection and storage of personal information, both online and offline. Those acts include:<sup>87</sup>

- The Telecommunications Business Act (1991)
- The Protection of Communications Secrets Act (1993)

<sup>86</sup> Korea Information Security Agency Website. Available at: [www.kisa.or.kr](http://www.kisa.or.kr). Accessed November 27, 2009.

<sup>87</sup> Park J. Current Issues and Developments of Information Protection in Republic of Korea. Presentation at Regional Expert Conference on Harmonized Development of Legal and Regulatory Systems for E-commerce. July 2004. Available at: [http://www.unescap.org/tid/projects/ecom04\\_s6park.pdf](http://www.unescap.org/tid/projects/ecom04_s6park.pdf). Accessed November 27, 2009.

- The Use and Protection of Credit Information Act (1995)
- The Digital Signatures Act (1999)
- The Act on Promotion of Information and Communications Network Utilization and Information Protection (1999)
- The Act on Protection of Consumers in Electronic Commerce (2002)

### ***Healthcare Policy***

**Governing structure:** The governing structure of NHIN<sup>88</sup> is developed for the purpose of efficient and effective implementation of its plan. Strategic planning, law, regulation and policies, standard authentication process, organizations, and incentives and strategic investment are considered for the management purpose of NHIN. Governing structure is important as much as other components of NHIN. Currently legislation – including the hospital information management, and individual consent on the health information use – are prepared and undergoing. National strategic plan for NHIN is prepared by the government. However, standard management process, incentives and strategic investment plans are still remaining for the further considerations.

**Organizations:** There are several organizations engaged in the NHIN plan to translate into action: MOHW, Health Industry Development Commission under the Office of Prime Minister, e-Health committee, Health Information Working Groups, National Health Information Standards Committees, and the CiEHR. Some are newly established and others are still in formation. The coordination and cooperation among organizations are important for the efficient NHIN implementation. These are the key organizations charged with the successful implementation of NHIN in near future.

### ***EHR Financing***

While the overall healthcare spending is 11.9 percent of the Korean GDP, the public health system is taking up only 10 percent of the total health system. Standard management process, incentives and strategic investment plans are still remaining for the further considerations.

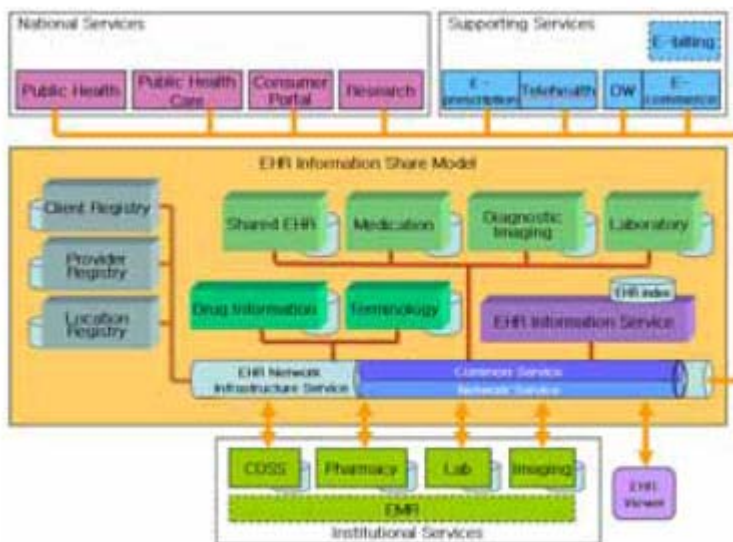
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<sup>88</sup> Kim, 2006.

## Technology

In the national health information share model, neither the data sets for health information sharing nor the NHIN data sharing model earned the consensus of the public yet.<sup>89</sup> However, a data share model is necessary and inevitable to support the information exchange between health systems. The national health information share model plays the role for any healthcare institution to be connected to the national services and to exchange the health information – but only if they follow the national standards. Though the public health system takes up only 10 percent of total healthcare system, the national health information share model is not only aimed for the information exchange of public healthcare systems. At the present time, CiEHR is responsible for the development of the national health information share model and to get the public consensus on the model.

The national health information share model is the technical information exchange model (e.g., networks); the national health information services are made of the services enabling the health information sharing at the national level beyond only one healthcare institution (e.g., e-prescriptions, lifetime health records, Telehealth, image information sharing, public health, data warehouse, e-procurement, and medical knowledge base sharing). E-prescription is known to be effective for improving the convenience of patients and reducing errors from the handwriting prescriptions; lifetime health records for the quality of care with the continuity-of-care as well as the self management of chronic diseases; data warehouse for healthcare researchers; medical knowledge database enabling the data sharing for evidence-based practice; e-procurement for efficient management of healthcare organizations; and so on. The development of national health information services is still undergoing and need to earn the consensus from stakeholders.



**Figure 2 National health information share model**

## Adoption

<sup>89</sup> Kim, 2006.

The public hospital covers only 10 percent of the total number of beds in Korea. The performance and the quality-of-care in public hospitals are far behind the private hospitals. HIT adoption in public hospitals is slow and inefficient.<sup>90</sup> The utilization and satisfaction rate of public hospitals and health centers is low. According to the national plan for strengthening public health system, HIT adoption in public hospitals is considered as a way for the modernization of the public healthcare system.

Many public hospitals are planning to adopt HIT by their own; however, most of public hospitals are faced with the lack of budget, experience and expert personnel. Not only are the costs of HIT adoption in public hospitals high, but its implementation at any individual institution makes it difficult for health information share. The HIT adoption effort of public hospitals will be pursued according to the national NHIN plan for efficient and effective implementation and investment.

### **Implementation Experiences**

The one of the biggest challenges for NHIN development and implementation is to build public consensus by clearing up the common misunderstandings and explaining the benefit of NHIN. There have been several projects proposed for national health information implementation for the past decade. These programs failed for many reasons including the lack of consensus by public, healthcare providers, payers, policy makers, and health information industries.

### **Next Steps**

A national strategic plan for the HIT adoption has been developed by government initiation. With the advanced information and communication technologies of Korea and the flexible attitudes toward new technology, we can expect the synergy effect from promoting the HIT adoption by the government for healthcare markets.

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## MALAYSIA

### Overview of Country Healthcare System

As of 2006, the population of Malaysia was approximately 27 million. Approximately five million Malaysians live in East Malaysia and 21 million live in the Malaysian Peninsula. The annual growth rate is 2.4 percent and approximately one third of the population is under the age of 15. Sixty-three percent of the population is between the ages of 15 – 64, while only five percent are over the age of 65. Malays comprise more than half of the population; Chinese account for approximately 24 percent; Indians, seven percent; indigenous peoples, 11 percent; and all others, 8 percent.<sup>91</sup>

The unemployment rate in Malaysia is three percent of its labor force and the literacy rate is almost 90 percent.

Malaysia enjoys a comparatively high standard of health, the result of long-established healthcare and medical services. There are only three large hospitals in Malaysia that are capable of supporting an HIE system: Subang Jaya Hospital, General Hospital and Penang Adventist Hospital. They are all located in the capital of Kuala Lumpur.

### National EHR Program

#### *National IT/ICT Status & Strategy*

The following organizations and vendors have agreed to participate in Malaysia's HIT implementation:

- **Malaysian Medical Association (MMA):** MMA is the national association of physicians. Its mission is to represent medical doctors and to promote the profession of medicine.
- **Association of Private Hospitals in Malaysia (APHM):** APHM is the national association of private hospitals. Its mission is to represent private hospitals and to promote their place in the Malaysian healthcare system.
- **OpenMenu Plus SDN BHD (OMP):** OMP is a joint venture consortium of companies and partners who have expertise in IT and software solutions for the healthcare industry.

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<sup>91</sup> Peninsular Malaysia information. Wikipedia Website. Available at: [http://en.wikipedia.org/wiki/Peninsular\\_Malaysia](http://en.wikipedia.org/wiki/Peninsular_Malaysia). Accessed November 27, 2009.

- **Mimos Berhad (MIMOS):** MIMOS is a government-owned company that researches and develops information and communication technology specializing in microelectronics.
- **Microsoft (Malaysia) SDN BHD:** Microsoft develops, manufactures, licenses and supports a wide range of software products in Malaysia, including operating systems, server applications, productivity applications and software development tools.

### *National/Regional EHR Approach*

The current state-funded plan is called the OpenMenu Plus Initiative and is designed to provide an entry-level set of HIT services and functions. OMP will implement a secure infrastructure that will enable the private medical sector – hospitals, clinics and laboratories - to interact with their patients, clients and partners. It will also provide general resources for doctors, including continuing medical education, directories of medical facilities and physicians, and drug information.

The OPM model appears to be evenly distributed, supporting both rural and city medical practices. Clinicians will be able to access the system through PCs, hand held devices, smart cards or telephones.

The use of smart card technology will enable transactions to be performed throughout the healthcare provider and payer sectors, including government, corporate and insurance entities. It will provide a legally binding, secure and auditable communications infrastructure designed to engender trust among its users.

While the infrastructure used for EHR data storage is highly secure, patients neither retain ownership of their medical records nor have specific rights related to their information.

### **EHR Governance**

#### *Legal/Regulatory*

The National Information Technology Agenda (NITA) was established in 1996 to provide a framework for coordinating and integrating three strategic elements: human resources, infrastructure and IT-based applications. Malaysia may be hampered in this attempt by the fact that there are no kickback or self-referral laws. In a society where business corruption is not uncommon, any attempt to stem the self-interest of healthcare professionals may create a barrier to sharing information on a uniform basis.

#### *Healthcare Policy*

A Health Technology Assessment (HTA) Unit was established by the Ministry of Health in August 1995. This purpose of this unit is to provide input into healthcare policy making, provide a sound scientific basis for technology adoption and deployment, and promote the continued use of existing technology. The Ministry has created a three-tiered organizational structure where

expert groups first carry out technology assessments with the help of the HTA, a technology committee then vets these reports, and the HTA Council rules on their recommendations.

## **Technology**

The Malaysian HIT initiative will rely on HL7 as the primary standard for the exchange and storage of data. The three main Malaysian hospitals are linked by a national HIE network that uses this standard.

## **Adoption**

All patients who have received care in one of Malaysia's three hospitals are automatically enrolled in the system.

## **Outcomes**

It is unclear how the Malaysian government plans to measure patient outcomes and healthcare improvements related to the implementation of HIT.

## ***Benefits***

Information to study the benefits of HIT implementation is in the early stage of collection by the Malaysian Ministry of Health. The Ministry is slated to report on cost savings and improved outcomes as early as 2008.

## ***Implementation Experiences***

Information was not available on this topic.

## **Next Steps**

Information was not available on this topic.

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## NEW ZEALAND

### Overview of Country Healthcare System

New Zealand and its larger neighbor, Australia, developed their healthcare system on the centralized model of universal healthcare found in England; it includes a public sector healthcare system funded by the central government and a much smaller number of private healthcare systems.

The public healthcare system provides services to 77 percent of New Zealand's population of more than four million residents.<sup>92</sup> Twelve and a half percent of New Zealand's population is 65 years or older and the majority of the population is of European ethnicity (78.5 percent), followed by Maori (14 percent), Asian (9 percent) and Pacific Island peoples (6.6 percent).

Public healthcare funding is managed through the New Zealand Ministry of Health who directs national funding to District Health Boards (DHBs). Twenty-one DHBs have been created since January 2001 when the New Zealand Health and Disability Act was enacted. On a local basis, the DHBs are responsible for healthcare spending and management for the population within each district. Regionally, the 21 DHBs are represented by four large geographical regions: North, Midland, Central and South.

New Zealand consists of two major islands – the North Island and the South Island. The majority of New Zealand's population (76 percent) resides in the North Island with approximately one third living in New Zealand's largest city, Auckland. More than half of the South Island's population lives in the Canterbury region, of which Christchurch is the largest city.

More than 50 percent of all New Zealanders live in urban areas represented by the five largest DHBs: Auckland (North DHB region), Hamilton (Midland DHB region), Napier-Hastings (Central DHB region), Wellington (Central DHB region) and Christchurch (South DHB region).

The Ministry of Health has set priority objectives for the population's health, all of which can be implemented by using electronic records. These include:

1. Reduced smoking;
2. Improved nutrition, reduced obesity and an increased level of physical activity;
3. Reduced rate of suicide/suicide attempts;
4. Minimizing harm caused by alcohol, illicit and other drug use to individuals and the community;
5. Reducing the incidence and impact of cancer;
6. Reducing the incidence and impact of cardiovascular disease;
7. Reducing the incidence and impact of diabetes; and,
8. Ensuring access to appropriate child healthcare services including well child, family healthcare and immunizations.

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<sup>92</sup> Statistics NZ, NZ Population Clock.

Based on statistics from the New Zealand Health Information Service, there were 445 hospitals in New Zealand in 2002 – 85 publicly funded and 360 private. The total number of hospital beds was 23,825, with 12,484 in public hospitals and 11,341 in private care. There were 572,232 inpatient discharges (with an average length of stay of 8.3 days) and 250,154 day patient discharges (a person admitted and discharged on the same day) from public hospitals.

## **National EHR Program**

The New Zealand Healthcare IT strategy has not recommended a single, centralized, national EHR system. Since 2005, DHBs have moved to support an interconnected information delivery network. All 21 DHBs have entered into a shared service agreement for IS (e.g., finance and/or patient management systems); corporate support (e.g., health provider contract management); and contracting or clinical data analysis.

### ***Physician Adoption Rate***

New Zealand physicians have embraced EHRs. A study published in 2005 reported that the electronic Patient Management System (PMS) adoption rate for GPs was almost 90 percent.<sup>93</sup> This high adoption rate – combined with the existence of the unique National Health Index (NHI) number, the Health Intranet and Health Link systems – has established the infrastructure to support the building of a complete EHR national system.<sup>94</sup>

## **Data Collection**

Regional data collection strategies capture individual healthcare data from patients to support the NHI and MWS (Medical Warning System). This information is used to provide data to various health databases including: the National Minimum Dataset (NMDS), the Mental Health Information National Collection (MHINC) and the National Booking Reporting System (NBRS).

## **Standardization**

In 2004, The Health Information Standards Organization (HISO) listed priority focus for the following standards that have been promoted into the EHR system:

- Ethnicity
- Health Provider Index
- LOINC Laboratory Codes
- Primary practice management systems
- HL7 messaging
- Referrals and discharges
- E-Labs
- E-Pharmacy

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<sup>93</sup> Didham R, Martin I, Wood R, Harrison K. [Information technology systems in general practice medicine in New Zealand](#). *N Z Med J* 2004; 117.

<sup>94</sup> Healthcare and Informatics Review Online.

- Primary care clinical performance indicators and referred services management
- Chronic disease management templates
- NHI and national collections
- Secure broadband and email connectivity.

### ***Architecture: A National/Regional EHR Approach***

In 2005, New Zealand Ministry of Health released its Health Information Strategy for the development of a distributed EHR system linked by a nationwide, secure broadband network; however, it did not pursue the creation of a centralized system. The Ministry of Health, DHBs and primary care organizations all subscribe to the New Zealand Health Network. This consists of VPNs operating and linked nationally under the guidance of the Health Network Code of Practice standards.<sup>95</sup>

This system of EHR starts at the local level, expands regionally and then nationally; the most detailed stored patient information, however, remains at the local level. Broadband networks then retrieve and share this information with other authorized network users. Within three-to-five years of its implementation, all community healthcare providers will be connected to a secure health information network. All primary and secondary care providers will interact electronically around key events, such as discharges and chronic care and disease management. The New Zealand strategy also calls for the development of a health provider index, e-pharmacy and e-lab systems, as well as an electronic patient referral system.

The recent decision by Australian states to adopt HL7 and the common New Zealand and Australia GOSIP profiles represents an opportunity to create a Common Economic Region (CER) Standard for Healthcare Systems Interconnect. This CER Standard would provide a basis for cross-Tasman healthcare exchanges between the two countries.

### **Funding**

The Ministry of Health has provided NZ \$1.4 million in funding for key national HIT systems. These local and regional systems will communicate with each other through a national system of interconnected links.

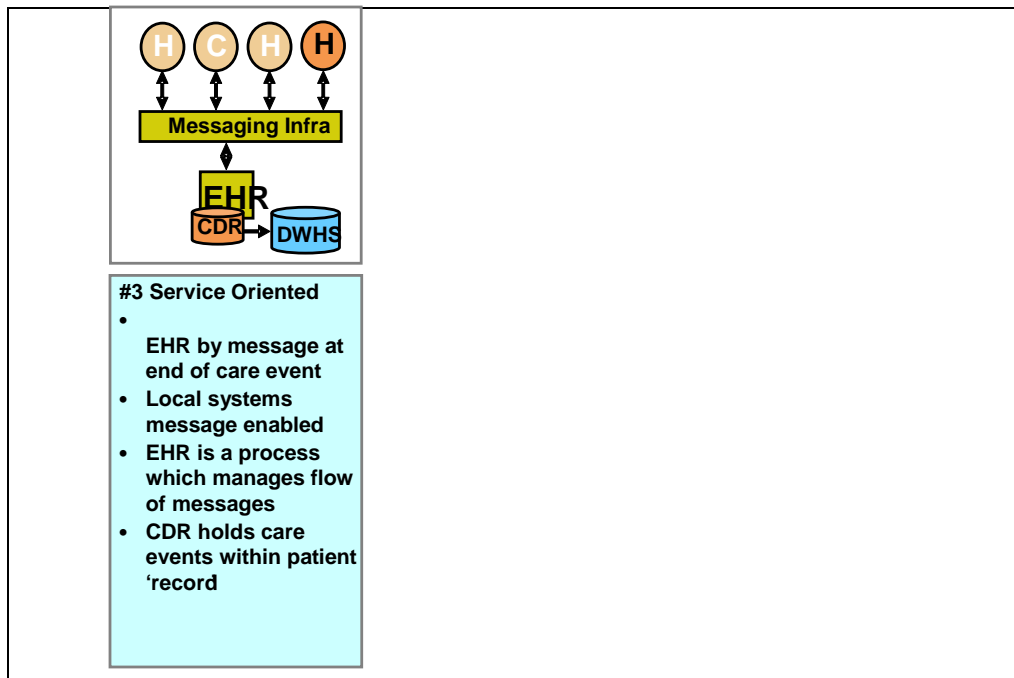
### **Operations**

New Zealand's approach to the implementation of a nationally connected EHR system and HIE is summarized by category #3 "Service Oriented" as shown in the following diagram:

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<sup>95</sup> Ministry of Health Website. Available at: <http://www.moh.govt.nz>. Accessed November 27, 2009.





The national system is driven by standards that have been developed through the collaborative efforts of NZ GOSIP, IEEE, EDIFACT working group 9 and TC 251. For example, real-time updates and queries throughout the New Zealand Health Information System (NZHIS) national system are supported by the HL7 Interface Standard for encoding transaction messages.<sup>96</sup> In this service-type model, transactions are pushed from the local and regional healthcare systems to the NZHIS during every patient point-of-contact care event at the same time that local patient records are updated. The contents of each data file are then checked against the business rules and loaded into holding tables. A record is also kept of the number of existing records that have been affected by this file. This includes any event that has been added or deleted, any record containing error or warning messages, and any other operating information including processing time. Diagnosis codes, including Diagnosis Related Groupings (DRG), are calculated during this part of the editing process. The edit/error module also maps ICD-10-AM and ICD-9-CM-A diagnosis codes.

HL7 standards are managed by the New Zealand HL7 User Group (NZHUG/HL7). Data generated by real-time transactions are streamed on a continuous basis using these HL7 message standards.

In the NZHI system, clinical data are sent with NHI numbers to ensure that individual records are captured. These include:

- Hepatitis B screening; through the New Zealand Hepatitis B Pilot Project;
- Laboratory claims: from laboratory tests processed by Health PAC;
- Maternity and newborn data: all pregnancies and newborn registrations are collected from NMDS;

<sup>96</sup> MOH Website.

- MWS contains known risk factors that may be important when making clinical decisions about patient care including: medical warnings incorporating adverse medical reactions and significant medical conditions; event summaries incorporating identification of the facility where the patient's medical record is located; and donor information incorporating donor summaries and healthcare user contact details using the ICD-9-CM-A range E930-E949 and drugs involved, and medical conditions; ICD-9-CM-A range 001-999;
- Mental health information: NHI numbers, demographics and legal status of patients with mental health conditions;
- Mortality data: using ICD-10-AM 2nd Edition and WHO mortality coding guidelines;
- National booking reporting system: information on numbers of patients waiting for publicly funded treatment, length of wait before receiving treatment, priority and booking status;
- National immunization records: all immunizations including childhood and adult immunizations, Tuberculosis vaccine (BCG) and Meningococcal vaccination;
- National minimum dataset: statistical information, including clinical coding data, for inpatient and day patients at time of discharge;
- National non-admitted patient collection: outpatient and emergency department activity including date, facility and type of service provided; and,
- Cancer registry.<sup>97</sup>

## **Personal Health Record**

New Zealand has not yet adopted a national PHR strategy that would allow patients direct access to their electronic records. There are, however, some local health facilities that provide patient Internet access to their records. Use of this service is still minimal and, in New Zealand, patients are not considered to be the legal owner of their records.

## **EHR Governance**

### *Legal/Regulatory*

The New Zealand Ministry of Health, Manatu Hauora, is the government's principal agent and advisor on health and disability. NZHIS is the division of this ministry that ensures that information is secure and protected from unauthorized access. The New Zealand Health and Disability Registration Authority ensures that anyone accessing the health data complies with all regulatory processes. NZHIS leads the development and implementation of IM and IT standards for the New Zealand health sector. Its role is to guarantee that relevant standards are identified for development and that, once defined, are implemented effectively.

The New Zealand Health and Disability Registration Authority also controls access to the NHI number, a unique identifier that is assigned to every person who uses health and disability support services in New Zealand. In its use of the NHI, NZHIS must meet the requirements of the Privacy Act of 1993 and the Health Information Privacy Code of 1994. The NHI is also

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<sup>97</sup> <http://www.nzhis.govt.nz/collections/collections-guide>.

associated with the MWS, designed to warn healthcare providers of any known risk factors that may be important when making clinical decisions about individual patient care.

Access to the NHI number is restricted to health workers authorized by NZHIS and DHBs. These include family doctors, nurses, midwives and hospital specialists. Creation or change of NHI details is further restricted to individuals who are authorized under the Health Information Privacy Code.

All hospitals are required by the Ministry of Health to provide clinical information electronically under the auspices of Section 22 of the Health Act 1956, section 139A of the Hospitals Act 1957 and the Cancer Registry Act 1993.

### ***Healthcare Policy***

The NZHIS mandates that:

- Information must be available across all levels of the national system with the most clinical detail being stored within the local systems.
- EHRs must be distributed, linked and referenced from local to regional to national entities. No central or single EHR exists in New Zealand.
- Shared clinical information to support safe and integrated delivery of healthcare must emanate from key health event summaries.
- Interoperability must be achieved. Common standards and information anchors that allow disparate systems to share information are essential for a successful EHR initiative.

As indicated above, access to the NHI is regulated by the Health Information Privacy Code 1994 released under the Privacy Act 1993. Interoperability standards are developed under the initiatives of NZ GOSIP, IEEE, EDIFACT working group 9 and TC 251, and online transactions are supported by the HL7 Interface Standard.<sup>98</sup>

Information that is held within the NZHIS database systems is accessed and maintained by authorized users logged on to host systems. Those host systems are operated by RHAs (regional health authorities) and CHEs (Crown Health Enterprises), both of which are responsible for healthcare provision within the DHBs.

The Ministry of Health is currently completing a Privacy Authentication and Security (PAS) project. This will set the standards on how the upgraded NHI interfacing will work, and how the various external and internal organizations will use it. Once these PAS standards are published, the Ministry plans to make the public interface widely available. Private sector practice management system developers will also be able to incorporate application program interfaces (APIs) into the PMS software.<sup>99</sup>

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<sup>98</sup> MOH Website.

<sup>99</sup> MOH Website.

## **Technology**

As indicated above, the New Zealand EHR architecture consists of a distributed EHR system linked by a nationwide, secure broadband network. By design, there is no single, centralized system. The national system is driven by standards that have been developed through the collaborative efforts of NZ GOSIP, IEEE, EDIFACT working group 9 and TC 251, and HL7 Interface Standard is deployed for encoding transactions between systems.

HISO provides standards for ethnicity, Health Practitioner Index (HPI), referrals and discharges, e-labs, primary care clinical performance indicators, referral services management, chronic disease management and ambulatory care (outpatients) data sets. The clinical areas that are exchange services with the NHI include GPs, ambulatory and inpatient facilities (private and public), practice management modules and e-pharmacies that are deployed for subsidized claims, constituting most of the public care arena.

## **Adoption**

The NHI has been in operation for 14 years. New Zealand's first national register, replaced by the NHI in 1993, was the National Master Patient Index. Newborns have been registered on the national system since 1992 and it is estimated that 98 percent of the population of New Zealand now have patient records in the NHI.

## **Outcomes**

The 81 Primary Health Organizations across New Zealand and approximately 3,000 GPs now utilize the NHI for patient record access and update of the national registry.

## ***Benefits***

Regional initiatives such as well child and diabetes registries have delivered a system that monitors conditions, reviews treatment progress and relays its advice to the GP. While the GP retains full clinical freedom and control, the additional information supplied by these registries has improved compliance and reduced adverse events. The EHR provides useful tools that assist DHB in addressing gaps in the system. Through the sharing of information and the use of queries, authorized users can deliver the right care at the right place and at the right time.

New Zealand's EHR implementation has created:

- Seamless delivery of care;
- Reduction in error rate;
- Sharing of information from multiple sources; and,
- An accurate and portable patient health record.

## ***Implementation Experiences***

While most GPs in New Zealand have been using electronic systems since 1985, consumer interaction with their own medical records is non-existent. New Zealand, with a primary care EHR penetration of 52 percent, is second only to the UK's 59 percent. Australia has a 25 percent penetration, higher than the US's 17 percent.<sup>100</sup>

The strategy for EHR in New Zealand continues to focus on regional CDRs that integrate patient records and clinical images. Systems are being implemented in stages and include chronic care management, mental health, community, ambulatory and disability systems.

Along with the NHI that stores minimum data set information and patient visit summaries, regional repositories are being established to provide clinical health event summaries. One example is the patient discharge summary that can be shared across primary, community, outpatient and inpatient care facilities.<sup>101</sup>

## **Next Steps**

As the delivery of healthcare shifts from disease treatment to disease prevention and from inpatient admissions to outpatient visits, the current system will need to be expanded to better align with these changes. This will require additional national data collections (e.g., primary, community and disability support services).

In the national collections, there is little information on GP visits. However, there is extensive information on the 1,700 annual admissions to hospitals, as captured in NMDS. Adoption, therefore, is limited in the scope of the data collected, but is always at a national level and driven through Ministry of Health policy.

Moreover, New Zealand health consumers are not featured significantly in the current system. The Ministry of Health recognizes the importance of involving consumers and has also identified the security concerns associated with the development of a complete PHR.<sup>102</sup>

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## PHILIPPINES

### Overview of Country Healthcare System

Over recent decades, the Philippines has made steady progress in improving life expectancy at birth (70 years in 2003) and child and infant mortality (40 and 29 deaths per 1,000 live births in 2003, respectively). Poverty and economic inequality remain high in the country and are major determinants of unequal health outcomes – under-5 mortality of the poorest 20 percent of households is 2.7 times higher than the richest 20 percent and persistent high child malnutrition rates exist. Philippines remains a high prevalence country for tuberculosis (TB), but has made very good progress in TB control. HIV/AIDS prevalence is low (adult 15-49 prevalence of 0.03 percent), but the epidemic is now thought to be “hidden and growing” due to evidence of increased rates of risk associated behavior. Maternal mortality is high (180 deaths per 100,000 live births in 1998) and is a priority concern of the Government as demonstrated by the fact that it was the focus of the World Bank-financed Second Women’s Health and Safe Motherhood Project approved in 2005.

Access to health services is inequitable because of financial barriers to care for the poor and unequal distribution of healthcare capacity. There is substantial private financing for healthcare at 54.9 percent, most of which (44.9 percent of total health expenditure) is from out-of-pocket. Even for the insured, there is substantial extra-billing by private healthcare providers. A little more than half of doctors are in private practice and a little under half of hospitals are private. Though public healthcare facilities provide a more affordable service for the poor, in public hospitals patients typically face additional costs due to lack of availability of drugs and supplies, as well as long waits and over-crowding in many public facilities.

The above situation can in part be attributed to low public expenditure on health relative to other low-middle income countries (US \$10 per capita per year, or 1.1 percent of GDP, in 2003). Private health insurance serves a relatively small, higher income segment of the population and has grown gradually to account for around 11 percent of health expenditure by 2003.

Prices of drugs in the Philippines is known to be one of the most expensive in Asia.<sup>103</sup> Drugs sold in the Philippines, according to Secretary Pagdanganan, are 40 percent to as high as 200 percent more expensive than those sold in other countries. This is despite that the fact the country was the first to pass a Generic Drugs Act.

### *The Current Health Reform Strategy: “Fourmula One for Health”*

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<sup>103</sup> Sun Star Manila Website. Available at: <http://www.sunstar.com.ph/static/man/2006/05/28/news/drugs.sold.in.rp.are.the.most.expensive.in.asia.gov.t.exec.html>. Accessed November 27, 2009.

In 2005, under leadership of Secretary Francisco T. Duque, the Department of Health (DOH) formulated a new health reform implementation strategy known as “Fourmula One (F1) for Health.” This strategy is based on a deeper understanding of the requirements of implementation and coordinated support from development partners. The F1 strategy organizes the reforms into four implementation components: Health Financing, Health Sector Regulation, Health Service Delivery (covering both public health and hospital reforms), and Health Sector Governance in Health (covering DOH’s internal management and sector coordination, as well as its stewardship over the whole health system). The new implementation strategy emphasizes the role of PhilHealth’s national social insurance program as the main lever to effect desired changes and outcomes in all four implementation components at national and local level.

The “Fourmula One” strategy coordinates health reform more closely with public expenditure management and governance reform, including public procurement reform, and measures to increase transparency and accountability in public expenditure management. Reform implementation planning has been integrated with formulation of a medium-term Health Sector Expenditure Framework, as well as the annual budget process. A performance monitoring framework for DOH, Philippine Health Insurance Corporation (PHIC) and convergence provinces will link budgeting and resource allocation to outputs and intermediate results.

### **Health Record Strategy**

The Philippines has no published strategy on developing a single architectural approach to the Electronic Health Record (EHR), but through a series of related initiatives is evolving a framework for the integration of information through the pragmatic adoption of standards-based solutions combined with open standards-based technologies. It is intended to build progressively on this work through maturing telecommunications infrastructure.

Past and existing projects that have contributed to current thinking on EHR and PHR include the open source Community Health Information Tracking System (CHITS) that centralized the capture of key clinical data within local health centers and ISIS (Integrated Surgical Information System), an integrated hospital-based patient IS of surgical data. More recently, the National Telehealth Centre has begun to develop SMS-based reporting protocols as a means of submitting strategic data points to higher levels of the health system. A series of successful pilot projects will soon take place using PHRs transfer combining USB, data sticks and the Continuity-of-Care Record (CCR). The distributed CCR based records are synchronized back into a central database of health records. This initiative is seen as an important demonstration of pragmatic EHR/PHR evolution.

All of these are aimed to bring fullness to the F1 strategies through the ONeHEALTH Program of the University of the Philippines Manila National Telehealth Center. ONeHEALTH is in effect providing the technical governance of initiatives driven from the Fourmula One national



strategy. ONeHEALTH recognizes that technology alone is not a solution and is to provide the services required to support the successful deployment of software solutions, namely the three elements of technology, learning and clinical medicine (termed E3). Individuals will be initiated into ONeHEALTH through each of these three initiatives, with the long-term goal of joining these into integrated framework for clinical interoperability. Undergraduate medical, nursing and midwifery schools can deploy EHR, e-learning, and e-medicine using whatever technology and connectivity is locally available.

## **EHR Governance**

There is no stated national strategy of EHR governance, but discussions are planned where alignment of governance processes for Fourmula One and proposals for ONeHEALTH will be discussed. Technical governance of projects may take place through the Philippines Health Information Network. The designers of the e-records component of OneHEALTH envision it as a credible implementation of the Fourmula One strategies. The current financing strategy of Fourmula One can be easily tracked with the local uptake of pilot e-records implementations - through the monitoring of members and utilization of e-records. E-learning and e-medicine initiatives may be made available as new innovative health services while a framework of regulation can more easily be monitored with the support of e-records and e-learning initiatives.

## **Technology**

Open standards and products based on these standards are to be fully exploited. Building on past work, a distributed architecture for the exchange of records based on a set of re-usable components are to be established:

- **Information standards.** The CCR has been successfully piloted as a mechanism for semantic integration of clinical records. Further work will review the potential use of HL7-based standards including the CDA.
- **Web services.** ONeHEALTH will focus on the development of standard Web services specifications that can be deployed across application protocols using any available network protocol - for example, the direct connection of hardware devices to Web services, as well as the storage and transfer of clinical data according to the CCR specification.
- **National services.** ONeHEALTH seeks to establish a patient master index service to integrate patient records across the broader enterprise. This activity will initially involve organizational decisions on how such an index should be implemented followed by technical implementation.

## **Adoption**

Too early to report

## **Outcomes**

Too early to report.

## **Next Steps**

With DOH support, the creation of an E-Health Council (as per Philippine Health Information Network or PHIN) and the establishment of ONeHEALTH pilot implementations.

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## **Health Metrics Network and Strengthening the Philippine Health Information System**

The strengthening of the PHIS is the main goal of the Philippine Health Information Network (PHIN), a multi-agency and multi-sectoral network led by the DOH with the National Statistics Office, National Statistics Coordination Board and the Philippine Council for Health Research and Development. The PHIN will facilitate exchange and sharing of relevant and quality information and knowledge as well as develop policies and standards for health information generation, sharing, interoperability, confidentiality and other concerns. The Philippines was selected by WHO as one of the first batch of 40 countries for piloting the Health Metrics Network whose purpose is “to increase the availability and use of timely and accurate health information by catalyzing the joint funding and development of country health information systems.” In mid-2007, the Network project is in its assessment phase. It is expected that in two years the project will greatly improve PHIN.

## **About the Contributors**

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## SINGAPORE

### Overview of Country Healthcare System

Singapore is an island economy with a population of 4.8 million in 2008. Its multi-racial society comprises of three major ethnic groups—the Chinese, Malay and Indians. Singapore boasts one of the world’s lowest infant mortality rates and longest life expectancies.

The top-ranked healthcare system (ranked 6<sup>th</sup> overall in WHO World Health Report 2000) comes at a relatively low cost. Over the past decade, the total expenditure on healthcare averages between three to four percent of GDP. In 2007, the government expenditure on healthcare was 6.6 percent of total government expenditures.

On the primary care front, private practitioners provide 80 percent of primary healthcare services while government clinics (called “polyclinics”) provide the remaining 20 percent. For secondary and tertiary care, the public hospitals provide 80 percent of the more costly hospital care, with the remaining 20 percent provided by private hospitals.

The public healthcare delivery system comprises of seven acute care hospitals, nine specialty centers and 17 primary care polyclinics. In 1999, these institutions were restructured into two vertically integrated clusters: National Healthcare Group (NHG) and Singapore Health Services (SingHealth). Both are owned by the government and partially funded through subsidies.

The private healthcare sector comprises 16 private hospitals and approximately 1,600 primary care clinics. A vibrant charity sector includes four community hospitals that provide intermediate care, and more than fifty nursing homes and hospices that provide long-term step down care.

### *National IT/ICT Status & Strategy*

The Singapore government is a strong supporter of ICT use, funding many national IT programs over the years across many industries. The country has a high household broadband penetration of 77 percent.<sup>104</sup> Offices and homes are increasingly being wired for high-speed Internet connectivity. Residents now enjoy free wireless Internet access around most parts of the island through the Wireless@SG program.

In 2003, Singapore’s incoming Health Minister, Khaw Boon Wan, identified one of his key priorities as to “Exploit IT Maximally,” with the ultimate aim of “One Singaporean, One Electronic Medical Record.” The Exploit IT Maximally Workgroup (ITWG) chaired by Deputy Secretary of Health, Goh Aik Guan, convened in September 2003 to drive the initiative. The ITWG began as a small group with several sub-groups to tackle issues such as law and ethics, culture and change management, publicity, and IT architecture standards.

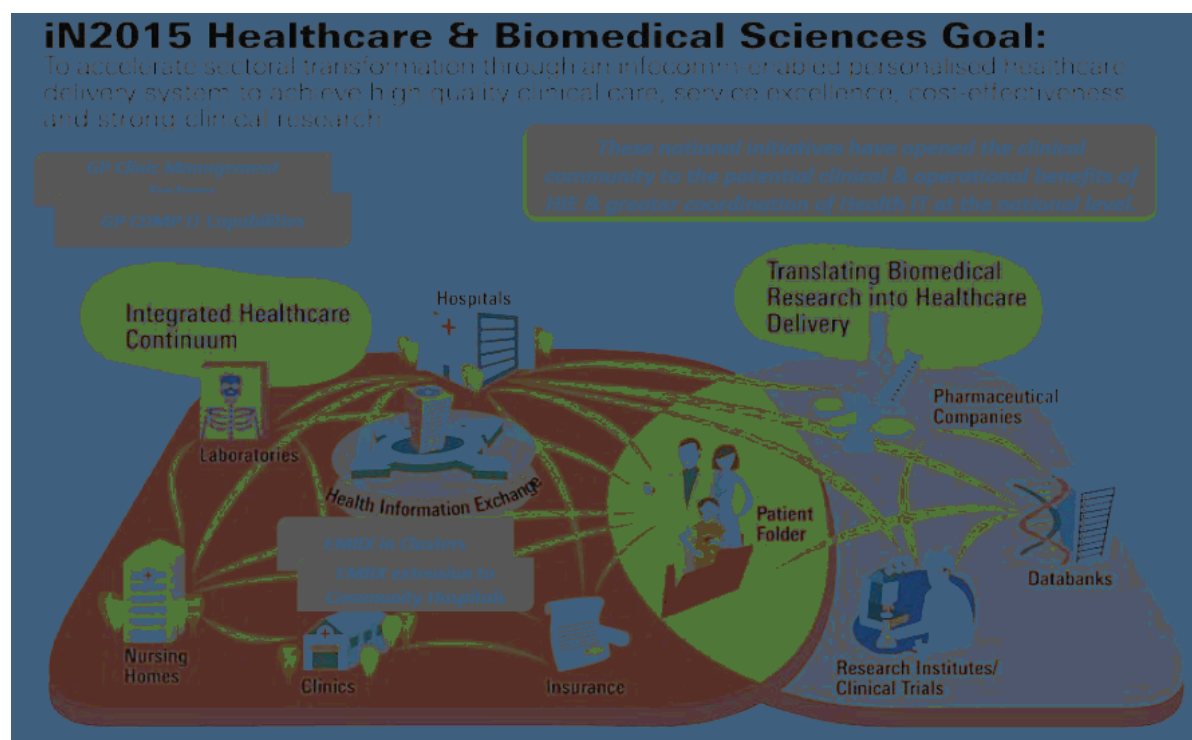
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<sup>104</sup> Infocomm Development Authority (IDA). *iN2015 masterplan – Health & Biomedical Services*. 2003.

Both public health clusters, NHG and SingHealth had already implemented clinical IT systems extensively as of 2008. Inpatient discharge summaries, medical and allergy alerts, and laboratory, radiology, and immunization records are now available in digital formats. Order entry for laboratory and radiology, as well as electronic medication prescription, are being widely used in the public health clusters.

To address the problems of interoperability between clusters, the Ministry of Health implemented an EMR Exchange (EMRX) system to enable secure health information exchange between clinicians in the public sector. In view of public sensitivities, however, data such as HIV and STD status are not shared through this exchange.

The IT strategy for Singapore's health and biomedical sector is further covered in the Infocomm Development Authority (IDA) iN2015 master plan. A national EHR system is envisioned to connect healthcare providers across the continuum of care as well as to the patients in the community. The government has provisioned \$200 million for this national EHR project to be launched from 2010 onwards.<sup>105</sup>



Source: IDA iN2015 plan

## National EHR Program

### *National/Regional EHR Approach*

<sup>105</sup> Khaw BW. MOH budget speech in Parliament - transforming healthcare. March 6, 2007. Available at: <http://www.moh.gov.sg/mohcorp/speeches.aspx?id=12394>. Accessed November 27, 2009.

To achieve the goal of a National EHR by 2010, the Ministry of Health Holdings (MOHH) Singapore created a CIO office. In addition, a new IT company called Integrated Health Information Systems (IHIS) was incorporated by MOHH, bringing together the IT resources of both NHG and SingHealth clusters into one entity.

## **EHR Governance**

The MOHH CIO office provides the overall governance for the national EHR program. During the National Health IT Summit in July 2008, MOHH announced the launch of a Clinical Advisory Group comprising of senior clinician leaders. Under the Advisory Group, various taskforces were created to look into vital EHR components such as CPOE, medication management, SCR and secondary data use. These taskforces aim to engage clinicians in the development of the IT roadmap for the future.

In addition to clinician engagement, several independent teams were created to look into data standards, data stewardship, privacy and security, and enterprise architecture.

## **EHR Next Steps**

The taskforces will help identify the business and clinical needs, creating the informatics road map for EHR development in Singapore. Further efforts are ongoing to develop an enterprise architecture blueprint, with harmonized data standards, as well as privacy and security policies that will lay the necessary foundations for the implementation of EHR in 2010.

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**About the Contributors**

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## **MIDDLE EAST**

### **ISRAEL**

#### **Overview of Country Healthcare System**

Israel's system of universal healthcare has a well-developed infrastructure of medical and paramedical services, as well as research and bioengineering capacities that serve its population of approximately 7.1 million inhabitants – with a median age of 29 and 70 percent of the population under the age of 34. Major population centers are Jerusalem (756,800 inhabitants); Tel Aviv-Yafo (392,000); Haifa (265,100); and Be'er Sheva (186,800). Responsibility for all health services lies with the Ministry of Health (MOH) that prepares legislation and oversees its implementation, controls medical standards nationwide, maintains food and drug quality standards, licenses medical personnel, promotes medical research, evaluates health services, and supervises the planning and construction of hospitals. The ministry also acts as a public health agency for environmental and preventive medicine.

The healthcare system provides extensive medical coverage through a network comprising of hospitals, clinics and mother-and-child-care centers. The high quality of medical care is reflected in the life expectancy of 82.2 years for women and 78.5 years for men, with an infant mortality rate of 6.3 per 1000 live births.

The National Health Insurance Law, in effect since January 1995, sets forth the state's responsibility to provide health services for all residents of the country (not including tourists), regardless of age or state of health. Residents are insured by one of four comprehensive healthcare organizations (HCOs) – Clalit Health Services (57 percent of the population), Maccabi Health Services (23 percent), Meuhedet Health Fund (10 percent) and Leumit Health Fund (10 percent); the law stipulates that a standardized basket of medical services (including hospitalization) be supplied by these organizations.

The main source of funding for healthcare services is a monthly progressive health insurance tax of approx 3.8 to 4.8 percent collected by the National Insurance Institute. Payment of health insurance premiums is compulsory and is deducted by employers with the self-employed remitting these payments directly to the National Insurance Institute. There is free movement between the healthcare funds who receive funding on a per capita division of resources from the government.

Forty-seven general hospitals presently operate in the country, with more than 14,000 general beds. Forty-five percent of the beds in general hospitals are in hospitals operated by the government; 30 percent are in hospitals run by Clalit Health Services; 6 percent in two hospitals belonging to the Hadassah Medical Organization; and the rest (19 percent) are in hospitals run by non-profit organizations and religious organizations. The health system also includes more than 14,000 beds for chronic care patients (including geriatrics) and some 7,000 for psychiatric patients. The health system has more than 3,000 community-oriented primary care clinics throughout the country, operated by the HCOs, the MOH or the municipalities.



The MOH operates a successful community health service: a nation-wide public network of 850 mother-and-child-care centers that offers low-cost, easily accessible services. About 460 centers are run directly by the MOH; others are operated by municipalities or the HCOs with the financial support of the MOH. The services provided include health education programs, regular checkups to monitor child development and a comprehensive immunization program (newborn to 5 years).

There is a relatively small private healthcare sector in Israel – insurance is available through private payers as well as through the HCOs that offer supplemental health insurance to cover medications and procedures not covered in the government’s official health basket. The vast majority of physicians who provide private services are also associated with the HCOs.

Israel has 32,000 physicians, 9,000 dentists, 6,000 Pharmacists and 54,000 nurses, approximately 72 percent of whom are registered nurses (RNs) while the rest are practical nurses. The ratio of physicians to patients and the number of specialists is high and compares favorably with countries in the OECD. The primary issue facing the country’s healthcare system today is adequate funding that is adversely affected by government budget priorities and a diminished tax-base due to the global financial downturn. An additional challenge to the national healthcare system is the “drain” of highly skilled medical personnel to either the private sector or other countries where higher financial rewards are greater.

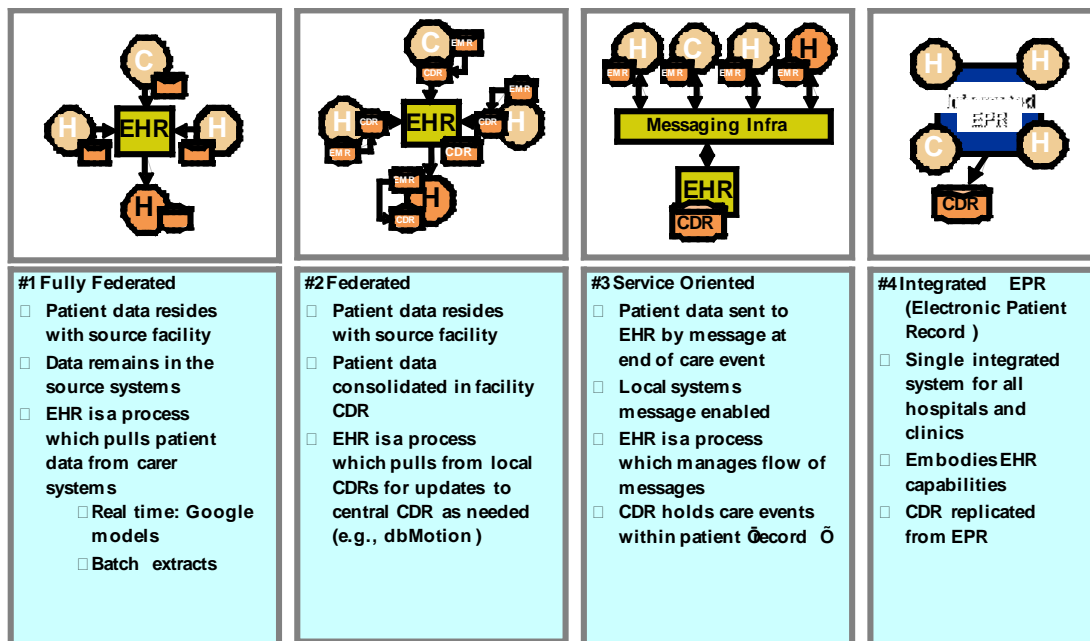
## **National EHR Program**

### ***National IT/ICT Status and Strategy***

The primary challenge to any healthcare system is to provide the best possible care for its patients. Israel’s largest HCO, Clalit Health Services, has led the way in successfully meeting this goal via its large-scale, cross-enterprise HIE whose innovative technology creates an EHR that facilitates proactive, preventive care throughout the continuum-of-care; enables the application of sophisticated quality measures; and addresses strict privacy and security concerns. As such, its approach is considered to be a backbone for implementing a nationwide, proactive-preventive healthcare strategy.

Throughout the country, 100 percent of medical services are computerized within the HCOs. Each HCO uses an EMR-like application for medical records as well as a wide variety of best-of-breed systems within both acute and community care environments. For example, within Clalit, more than 25 major health ISs are in use. Broadband Internet access is readily available and universally utilized by the HCOs. Within each HCO, various degrees of quality measures and BI instruments are employed to meet the priorities of preventive healthcare. The sophistication of the HIT environment in Israel serves to provide patient-centric care by enabling ready access to patient information by primary care givers within each HCO. In regards to PHR availability/usage, each HCO operates a Web-based portal that provides patient access to elements of the patient record as well as access to other HCO services that are widely used in a country with one of the highest rates of broadband Internet access in the world.

## National/Regional EHR Approach



NOTE: EHR is a service not just a data repository i.e. does processing; further details provided in the next slides.

More than 70 percent of the Israeli population is served by the Clalit Health Services/Rambam Medical Center/Sheba Medical Center HIE – a national-scale system encompassing 16 hospitals (8,100+ beds), more than 1,300 primary and specialized clinics, and 400 pharmacies. This innovative, state-of-the-art implementation of clinical data exchange is based on a SOA-based platform for medical information sharing that was developed to meet the following challenges: no single point of failure; no need to replace existing information systems; defined minimal data set; data to remain in original location and format; data only available for specific patient-centric queries; data only available at time of medical care and on a view-only basis; drill-down ability into data; adherence to security and privacy standards (based on Israel’s MOH Ethics Committee guidelines as well as those of US-based HIPAA) that are both “rules” and “roles” based; efficient performance; ease of implementation requiring minimal training and support staff; and scalability, flexibility and robustness.

Using a federated and de-centralized Web-based architecture, this system, developed by Israeli HIT vendor dbMotion, queries asynchronously the entire set of local repositories, integrates the responses and presents the caregiver – on-demand – with a unified, integrated patient record, all within seconds; the record is for viewing only and "evaporates" afterwards (i.e., the “virtual patient record”).

The system ensures that the patient medical information viewed is the most up-to-date; for example, new lab results from another repository or legacy system are immediately presented to the caregiver and can be evaluated – in the same Virtual Patient Record – with other comparable relevant historical data. Of high priority throughout is the maintenance of privacy and information security. Because the system is modular, providers can decide which information to include or withhold. Within Clalit, for example, information from the two psychiatric hospitals is

withheld from the main network that includes Rambam and Sheba. The reverse is not true as caregivers within the psychiatric hospitals have full access to the medical information collected in the general network. The system allows the administrators the flexibility to choose what or what not to show.

In 2006, Clalit's medical information sharing system was awarded SI ISO 17799 Information Security Management System Certification. SI ISO 17799 covers a range of threats, including internal and external threats, accidents, malicious actions and industrial sabotage.

The Israeli government issued a formal RFI for a national health record in 2004 – however, this process is currently stalled due to other legislative priorities. In lieu of formal legislation, and leveraging the fact that already more than 70 percent of the population is served by a *de facto* national-scale EHR, the MOH has embarked on several limited pilots for a national health record.

## **EHR Governance**

### ***Legal/Regulatory***

Responsibility for all Israeli health services lies with the MOH, the overarching regulatory body for all issues regarding healthcare. As such, it oversees the four HCOs – Clalit, Maccabi, Meuhedet and Leumit. The Israeli healthcare system uses the unique Israel national identity number of its citizens as the patient identifier within its healthcare system. The legal/regulatory issues regarding encountered during the establishment of the Clalit/Rambam/Sheba HIE were addressed by Clalit with a combined top-down and bottom-up approach – primary caregivers and community clinics focused on the practical elements needed at the point-of-care with management providing the organizational and financial backing for development and implementation. This combined approach factored heavily in the project's success by making all sectors of the healthcare organization stakeholders in the project.

Processes were established to secure project funding and committees tasked with defining primary objectives and prerequisites. A Steering Committee held overall responsibility for the whole project, approving work plans and recommendations from various committees. The Legal & Medical Ethics Committee consisting of legal personnel, community and hospital physicians, medical directors, and technology experts was responsible for security and privacy definitions including the creation of profiles and permissions as well as defining caregiver/patient relationship (e.g., conditions a caregiver may view the patient's medical information). The Users' Committee, comprised of representatives of users from different disciplines (internal medicine, surgery, family physicians), was tasked with providing solutions for a variety of user-related issues to the implementation of the system (e.g., determining features and functionality of the Presentation Layer). The Chief Medical Officer (CMO) in charge was a senior physician leading the Steering Committee with overall responsibility for the implementation and deployment of the chosen solution throughout Clalit. This mechanism of committees defining various elements of the implementation was also activated when the network was expanded to include Rambam and Sheba medical centers. The federated technology approach provided a solid foundation for cooperation and minimizing potential barriers by enabling all participants in

this project to retain their data ownership, investment in existing systems, and adhere to MOH security and privacy standards.

## **Healthcare Policy**

The Israeli Health Insurance Law determined a basic list of health services to be provided to all residents by public funding. Through the auspices of the MOH and its focus on technological innovation as a means to provide effective health services, the Israeli healthcare system has reached a high standard of medical care as expressed by parameters such as long life expectancy and low infant mortality. The success of the Clalit/Rambam/Sheba HIE serves as an example for healthcare policy makers in regards to national EHR adoption. Policy issues regarding data usage, ownership, privacy and security are fully addressed within this implementation by use of a SOA-based, commercial solution with a federated approach that through a Web-based viewer enables viewing of an integrated EHR with the source information remaining in its original location and format.

## **EHR Financing**

HCOs receive government funding on a per capita basis. HCOs fill the role of both provider and payer within the Israeli system, expending resources under the supervision of governmental bodies. The Clalit implementation of an EHR connecting its 14 hospitals and 1,300 clinics has enabled the streamlining of its healthcare practices and brought various clinical and business benefits through the availability of an integrated, cross-enterprise medical record. These are benefits invariably shared by the partners of the HIE, namely Rambam and Sheba Medical Centers. As cited earlier, the primary barriers in Israel to a national EHR is one of legislation and additional funding that would be needed above and beyond the individual budgets of each HCO. Because Israeli healthcare provision is centralized through four HCOs, the largest of which already has a functioning EHR serving 70 percent of the population, the organizational barriers to the establishment of a national EHR are ostensibly minor.

## **Technology**

The Clalit/Rambam/Sheba HIE utilizes a SOA-based interoperability platform deployed in a federated approach to meet the primary requirements as set out by the organizing committees:

- **MDS (Minimal Data Set)** – Support/permit sharing of a subset of the patient’s available medical information (defined by the Users’ and Ethics Committees); easily adjust the dataset’s definitions’ all basic information viewable on one screen, defined by the caregiver; enabling immediate start of care cycle; easy access and user-friendly.
- **Drill-Down Ability into Data** - For rapid diagnosis using detailed information, saving time within the “window-of-care” (e.g., seven-eight minutes per patient in a clinic – the physician cannot dedicate more than one minute for the relevant information drill-down).
- **Decentralized Structure** - All information required to stay in originating systems/locations’ alleviate need for central database creation and replacement of

existing disparate operational systems; information to be “virtually” patient-centric with limited caregiver access per permissions.

- **Strict Security and Privacy** - Adhering to Israeli privacy laws, meeting international standards of security compliance (e.g., HIPAA).
- **Performance** - Ensure usage/acceptance with strict minimum requirements - 15 seconds maximum (*performance today stands at 4-6 seconds*) for collection and display of all relevant data.
- **Scalability, flexibility, robustness** – Ease of user/site/operational system growth; high degree of flexibility in user parameters (adapting security requirements to ethics guidelines, easy connectivity to new operational systems); strict robustness criteria required ensuring the solution’s ongoing mission of critical abilities.

In this architecture, every entity participating in a network has a dedicated node that interacts with other organizations as well as receives internal interoperability services. This means that each participant in the network individually manages its security policy, vocabularies, data policy and other parameters. Data exchange between organizations or participants in the network is based on the establishment of individual agreements (“contracts”) between pairs of organizations as to what information is exchanged and how – generally a network has a generic agreement that may be altered in special cases. In addition, individual organizations retain independence regarding development and growth. For example, one organization might choose to add new services for its internal needs; this can be done without affecting the other members of the network.

This federated architecture offers several important advantages. Primarily, all the information in the network remains under its original ownership thus addressing legal and political issues often arising during the establishment of an EHR/interoperability network. When information is owned by its original creator, there is no doubt about who is responsible for it and who decides when and how it should be used. User management is simplified, extending only to each organization’s users rather than the entire network. Vocabularies and interfaces to the operational environment are managed separately and in a more flexible way. Finally, a greater degree of customization in the different parts of the system is possible, as different organizations do not have to use the exact same configuration.

Strict security and profiles are implemented throughout this system. The authentication framework fulfills all Legal and Ethics’ Committee guidelines. There are several situations/methods in which a caregiver can enter the system: using the patient’s HCO card that is “swiped” through a reader providing entry to the patient’s medical record; entry via the authorized access list in an acute care setting; or being on the physician’s patient list (whether in a community practice or within a hospital department). The solution includes a comprehensive and innovative response to all the issues related to information security and patient’s privacy including: authentication (i.e., ensuring that only authorized users can access the system and, through it, patients’ records); authorization (i.e., ensuring that only the information that was

decided upon is transferred to the caregiver and under strict rules regarding patient – caregiver relationship); auditing and tracking (i.e., a detailed tracking of each action executed in the system). In this way, it is possible, in every given moment, to go back and check which user viewed which information elements and for which patient.

The full list of medical information now available to the hospitals and to the community within the Israel HIE's Virtual Patient Record (the EHR) includes:

Hospitalization	Surgery
Diagnosis	ER and Outpatient
Visits	Sensitivities/Allergies
Medication	Main complaints
Laboratories	Problem List
Imaging	GP encounters
Pathology	Vitals
Procedures	Caregiver-to-Caregiver Messaging

Federated architecture is generally adopted by multiple stakeholder organizations/networks where information ownership and management issues are often key factors (e.g., such as regional and national projects). This approach can also be adopted by large enterprises.

## **Adoption**

Today, the Clalit/Rambam/Sheba HIE serves more than 15,000 caregivers of the Israel EHR system. The intuitive user interface – developed in conjunction with user-committees –has allowed the painless and easy adoption of the system with minimal need for formal training. This use is mirrored throughout all areas of healthcare provision (i.e., acute and community care).

## **Outcomes**

As already noted, the Israel EHR is used by more than 15,000 caregivers throughout 16 hospitals, more than 1,300 clinics and 400 pharmacies. It has enabled the wide use of medical protocols and medical quality Key Performance Indicators (KPIs), including lists of populations requiring future medical action and/or intervention at both the doctor and clinic levels. Extensive use of KPIs in all aspects of managing the healthcare delivery organization includes: budget, payroll, HR, marketing, billing, customer satisfaction surveys, chronic illness monitoring, logistics, appointments and prescriptions. In addition, it has facilitated planned discharge and the utilization of internal messaging from Clalit-owned hospitals to Clalit-owned primary care community clinics.

Real-time patient lists for the family GP of their patients currently hospitalized, in the ER, or with an outpatient (ambulatory) appointment are possible. These lists are delivered through the medical information sharing system as presented via the EHR. The GP is encouraged to use the internal messaging to communicate with the hospital staff. This is another clear and practical expression of the organization's expectation that its clinicians implement proactive and preventive medical protocols. It is possible for use of the EHR to bring timely patient-centric and secure medical information to every clinician and caregiver in the organization – wherever that

encounter may take place. This exemplifies the practical expression of the Clalit guideline to ensure “better healthcare at every point of care.”

## Benefits

- **Proactive and preventive healthcare:** Applying medical protocols and KPIs to manage individual patient health and populations-based health management (e.g., chronic illnesses, elderly).
- **Patient-centric continuum-of-care:** From the hospitalization event until the patient’s discharge and return to the care of the community clinic.
- **Medical information sharing:** This brings timely patient-centric and secure medical information to every clinician and caregiver in the organization, wherever that encounter may take place.
- **Medical information sharing with competitors:** Sharing information with Rambam and Sheba and the establishment of a HIE to create a *de facto* national-scale EHR in Israel

## Implementation Experiences

Critical to this successful implementation was the involvement of the Clalit committees that defined the various technical and business objectives of the HIE. Inclusion of the project’s key stakeholders was critical to caregiver buy-in and subsequent adoption. Implementation of this federated solution required minimal change management and did not disrupt clinical workflow – for example, integration of the Rambam Medical Center (a 900-bed government hospital) into the Clalit network was completed within four months and Sheba Medical Center (1,700 beds) within six.

There are multiple lessons to be learned from this successful implementation of a large-scale, cross-enterprise medical information sharing network and its resultant EHR. Foremost of these is that its creation is a realistic goal. In addition, a comprehensive approach can dramatically increase the quality of healthcare benefits for all stakeholders in the continuum-of-care, from patients to caregivers to healthcare providers. The challenges to its realization can be overcome by choosing a medical information sharing solution that addresses the issues of scalability, complexity, information ownership, security and privacy that are inherent when dealing with healthcare’s vast array of organizations, standards and IT systems. Furthermore, it is important to balance a focus on pragmatic and realistic goals that can be reached in a stepwise fashion, with a long-term vision that will ensure that early decisions support, rather than hinder, long-term efforts.

## Next Steps

The growth of the Israel EHR system into a truly national network is contingent on national priorities set by the government. The Clalit/Rambam/Sheba HIE patient-centric approach successfully leverages its EHR data to meet the continuously growing demands for advanced healthcare provision. It does so by utilizing its SOA-based medical information sharing platform to create new applications and services, meeting the needs of today and tomorrow.

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## SOUTH AMERICA

### BRAZIL

#### Overview of Country Healthcare System

With a total area of 8.5 million km<sup>2</sup>, the Federal Republic of Brazil includes 26 states, the Federal District, and 5,560 municipalities. Each level of government has political, fiscal, and administrative autonomy, with exclusive and concurrent competencies as well as joint responsibilities. The government has a presidential system.

The Brazilian population is about 190 million with an average population density of 21.9 inhabitants per km<sup>2</sup>, with values ranging from a high of 86.1 in the Southeast region to a low of 3.9 in the North.

#### Health System Organization

The health sector in Brazil comprises a complex network of services encompassing both public and private suppliers and financiers. The private sector includes for-profit providers and not-for-profit charitable organizations. The private system of health plans and insurance covers 24.5 percent of Brazilians,

percent of the privately population being beneficiaries of health and 56 percent dependents of primary beneficiaries. Most of users of the private reside in the cities of Southeast and South

The private system underwent considerable during the 1990s, especially in the second the decade.

The public subsystem segments – one that provides free universal for all citizens by right, financed by public resources (Unified System or SUS – Único de Saúde) and other that offers restricted healthcare to government

Figure: Health System organization in Brazil

Subsystem	Public		Private	
	Universal	Restricted	Pre-Paid	Direct Disbursement
Segment	Public: Union, states, and municipalities	Self management/ Public organizations	Health plans and insurance plans (Supplementary)	Private, autonomous
Population accessing service type	75.4% (129.5 million) -- 100% if public health and health surveillance activities are included	5.1% (9 million)	19.5% (34.2 million)	....
% of total health expenditure	41.6%	...	21.0%	37.4%
Access Type	Universal	Captive clientele (institutional link)	Pre-paid or coverage by insurance	Direct disbursement
Financing	Taxes and social contributions	Public employees and employers	Employees and employers or family income; government subsidies *	Family income Government subsidies *
Network of services used	Own (public federal, state or municipal), charitable or profitable	Own, private charitable, or profitable	Private profitable or charitable	Private profitable or charitable
Expected coverage	Comprehensive (public health activities, health promotion; basic care, specialized outpatient care, and hospital care; diagnostic)	Variable (in general, medical and hospital care; diagnostic and therapeutic procedures)	Variable (in general, medical and hospital care; diagnostic and therapeutic procedures)	Variable (in general medical and hospital care; diagnostic and therapeutic procedures; drugs)

©2010 He:

Source: Piola, S. and Muds, E. 2005. \* Note: Indirect subsidies, through fiscal exemptions granted to employer companies and to families.

44 covered primary plans

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Health Sistema the

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employees (civilians and military), financed with public resources and employee contributions.

The public health sector – to which access is universal – is the sole provider of healthcare coverage for 75 percent of the population and provides public health services (e.g., epidemiological and health surveillance, control of communicable diseases) for the entire population. The segment of the population covered by private health plans also use the services of the SUS, especially for highly complex or costly procedures/treatments (e.g., transplants, HIV/AIDS treatment, pharmaceuticals). SUS health services are delivered through federal, state, and municipal government networks and by private contractors, including both not-for-profit and for-profit entities. The SUS includes subsystems at the level of each state (state SUS) and each municipality (municipal SUS).

### *Delivery of Services - Access to Care*

Access to health services is ensured for the majority of Brazil's population. Data from household surveys indicate that 98 percent of people who reported seeking some type of health service in the reference period said they received care when they sought it. This percentage is slightly lower for the population earning minimum wage salary or less (97 percent) and slightly higher in the income bracket above minimum wages (99.5 percent).

According to the 2005 health and medical care survey conducted by IBGE (Brazilian Institute of Geography and Statistics), there were 77,004 health facilities in the country, 70.4 percent of which were public. In 1976, 18.1 percent of facilities with inpatient capacity were public while 81.9 percent of the hospital facilities in the country were private. In 2005, 38.1 percent of the hospital facilities (2,727) were public and 74.6 percent of non-inpatient health facilities were public. The public system as a whole has 59,177 health facilities; of these, 47,110 (79.6 percent) provide outpatient care. SUS hospital care recorded nearly 13 million hospitalizations in 2005, with an average stay of 5.9 days.

In 2005, the total national census of hospital beds was 443, 210 – of these, 34 percent were located in public institutions, the remaining 66 percent were private. However, the public bed supply is augmented with 82 percent of the private beds via SUS financing. In total, close to 88 percent of the beds in the country are certified for use by the universal public system.

In the ambulatory area, recent population data reports the number of medical consultations per person in 2003 was 2.4; for rural areas, the rate was 1.8. In general, the Northern states experienced greater access difficulties due to lack of available services and the widely dispersed population. Interestingly, the same survey identified “oral healthcare” as a major health services concern: 22 percent of the population age 5-19 years old has never had access to dental treatment. In the public system, 63 percent of outpatient procedures overall involve “basic care.” In the North, this percentage is 72 percent.

Public and private healthcare facilities together were responsible for providing 1.6 million jobs in 2005, including technical, auxiliary and professional level personnel. In 2005, Brazil had 870,361 job posts held by high-level professionals in health facilities, an increase of nearly 20 percent from the previous survey three years earlier in 2002. Of these, 61 percent were doctors, 13 percent were nurses, and 8.2 percent were dentists. All other high-level professionals combined held only 18 percent of the jobs.

## ***Financing, Expenditures and Allocation of Resources***

Brazil's total health expenditures in 2005 were 8 percent of GDP, with 38.8 percent being publicly financed.

The Brazilian health system has a mixed financing arrangement, in which public and private sources of financing coexist. Public financing covers nearly 48 percent of the total health expenditure, originating in general taxes in the three government spheres and in social contributions (federal). The Federal Union's portion in financing the SUS was a little more than 50 percent of the total for the public system in 2004; states contributed nearly 27 percent, and municipalities 23 percent. In 2006, the Ministry of Health's budget was R\$ 44.3 billion, and it was approximately R\$ 46.8 billion in 2007. Nearly half of these resources are transferred to states and municipalities.

Private financing comes from companies and families. Company (employer) expenditures are primarily used to pay for insurance or health plans for employees and dependents (typically in the form of a partially paid fringe benefit). Private family expenditures tend to be concentrated in the highest income brackets. In 1996, the richest 30 percent of the population was responsible for 68 percent of family-paid health expenditures, while the poorest 30 percent accounted for only seven percent of family expenditures.<sup>106</sup>

## ***Legal and Regulatory Issues***

By law, municipalities have primary responsibility for providing healthcare services to their respective populations, supplemented with technical and financial assistance from the federal government and the states. Nationally, the SUS is managed by the Ministry of Public Health, who has primary responsibility for regulatory and coordination functions and plays a major role in financing of the system. The SUS carries out ongoing functions of coordination, planning, linkage, negotiation, monitoring, control, evaluation, and auditing with each of these tasks incumbent on the three levels of government.

## ***Information and Communication Technology (ICT) Indicators***

- Total national expenditures for ICT in 2007 was US \$24 billion (2 percent of GDP), with US \$26.8 billion projected for 2008, growing to US \$36 billion by 2011.
- By June 2008, 10.04 million Brazilian households (or 50 percent of households with Internet access) had broadband connectivity.

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<sup>106</sup> As Brazil still doesn't have a national health accounts system, reliable data doesn't exist on the total health expenditure (public and private) with internationally comparable criteria.

- In 2007, more than half the Brazilian population over 10 years of age (53 percent) claimed to have used a computer. Forty-three million Brazilians said they access the Internet regularly, 26 million reporting “at least once a month” and 22.8 million “daily.”
- One quarter of Brazilians over 16 years old (25 percent) used an e-government service in 2007, the most popular being, “Checking the Taxpayer Registration Number.”
- Almost half of the Brazilian population has carried out some activity on a computer (49 percent) and computers are present in 94 percent of enterprises with 10 to 49 employees and in 100 percent of organizations with more than 50 employees.
- ERP software package for data integration (often used in EHR implementation) are used by 47 percent of the companies. CRM (Customer Relationship Management) applications to manage information are in use by 40 percent.
- Brazil represents 47 percent of the total number of ICT workers in Latin America (900,000 professionals).

### ***Healthcare Policy***

In 2006, the National Supplementary Health Agency (NSHA or Agência Nacional de Saúde Suplementar – ANS, Ministry of Health) – jointly initiated with the National Health Card Project (NHCP) on the implantation of another health information project known as the Supplementary Health Information Exchange (TISS -- Troca de Informação em Saúde Suplementar). Its objective was to establish a national standard information exchange focused on epidemiological analysis between health plan organizations (HPOs) and healthcare providers (HPs). These electronic linkages have now been implemented throughout the country, creating information exchange in the mandated XML format between private providers and private HPOs (e.g., health plans, insurance plans).

By the end of 2008, the TISS Project stood out as a clear success in the e-health area. The TISS platform replaced seven previous information systems for the supplementary health sector and demonstrated the ability to integrate health information from throughout the country, joining the public and private systems and creating a single national data set. In this way, it is hoped the TISS project will encourage innovative approaches for delivering healthcare. In addition, the “Qualification Program” was introduced by NSHA to create quality-based rankings of health plans and encourage them to improve health outcomes.

The integration of the public and private systems through TISS and the national implementation of standards for communication through the TUSS Project (Terminology Unified in Supplementary Health) should facilitate the more rapid adoption of an EHR, although such a specific project for this hasn't yet launched.

### ***The National EHR Program***

Despite being the world's tenth largest economy, Brazil still lacks direction in defining specific projects to advance its national EHR program. The public policy program that serves as the foundation for an EHR is the Ministry of Health's NHCP launched in 2000. The NHCP includes goals for defining standards for unique individual identifiers, the health organization and interacting healthcare personnel, as well as a core patient data-set for characterizing the healthcare encounter.

The project incorporates two types of magnetic ID cards: (1) a *Users Card* that includes a national identification number that is read by dedicated terminals specifically developed for the project; and, (2) a *Professional Card* that identifies and allows professionals system access. In 2003, the project was revised because it had not yet reached 50 percent of the projected goals. When the NHCP is fully implanted, it will incorporate an EHR of national scope. Financed by the Inter-American Bank of Development (BID), it had distributed close to 24 million cards nationally by 2006.

One could say that the history of Brazilian healthcare IS has been characterized by difficulties caused by system fragmentation as most application systems were developed to address different problems, using specific vocabularies and varying types of patient and workers identifiers. As a result, by some reports there are now more than 200 health IS of different complexities with a low level of integration between them. In January of 2003, the federal administration created a Health Information Division in the Ministry of Health to coordinate all the initiatives concerned with the use of health information and healthcare IT. Among its tasks, the Health Information Division has responsibility for coordinating the development of national Health Informatics and Information Policy.

Despite its ambitious title, the “National Plan of Information and Computer Science in Health (2003)” only managed to establish a limited, preliminary digital health record. The Plan describes a goal of “establish[ing an] Electronic Health Record that allows to recover, through electronic forms, the health information of the individual in his several contacts with the healthcare chain, with the goal of improving the quality of the working processes, including the local availability of information for the attention to the health,” but its results remain far short of the country's needs.

### ***National PHR Approach***

While the PHR concept has gained great popularity in other industrial nations in recent years, examples in South America still are uncommon and none have had large scale implementation. Some telecommunication companies have expressed interest and have been observed seeking partners in the IT market for the projects.

The Brazilian public health sector is also currently devoid of PHR projects. All the initiatives are still confined to the private market, based on the participation of international companies and of low impact. However, there is much interest in the movement and one should expect accelerating activity in the next few years.

### ***Regional EHR Approach***

### *Initiatives of the individual Brazilian States:*

#### **SIGA Saúde - São Paulo City Health Information System**

São Paulo is one of the largest cities in the world, with 10.3 million people in the city and some 18 million in the surrounding Metropolitan Area. In 2004, São Paulo Public Health came to operate as a “full managed-care” city, meaning that resources from the National Health Fund are transferred directly to São Paulo City Department of Health (SPCDH) on a capitation basis. In exchange, the city agrees to meet certain production and quality goals and has to send monthly reports that allow the Ministry of Health to assess if those criteria are being met.

By becoming a “full managed-care” city, on an annual basis the São Paulo Department of Health became responsible for: (1) 10 million primary care consultations; (2) 8.5 million specialized consultations; and (3) 550 thousand hospital admissions.

When São Paulo decided to invest in an IS capable of supporting a Patient Flow Control process and providing an EHR, it began with a Municipal Health Register designed to process the identification data for all local healthcare users, workers and organizations, as well as documenting the relationships among them. The Register is a primary data source for all the other modules, as no operation can be carried out unless its participants are registered. The Municipal Health Register data are fully compliant with SUS operations and this is the subsystem that stores and processes the standard vocabularies they use.

Similarly, Patient Flow Control (PFC) handles all requests for healthcare services (consultations, procedures, inpatient admissions and emergencies) and finds the best possible match based on criteria such as budget, distance, availability and waiting time. This module also processes authorization requests for high-cost, high-complexity procedures. Exceptions, such as resource use exceeding predefined limits or services that are unavailable, are handled by an accredited physician who can extend the budget, find available resources or designate the request as pending for a period of time if that is appropriate. PFC also tracks patients within various healthcare units and copes with waiting lists and referrals.

The ambulatory care EHR collects a standard dataset from each encounter and triggers related follow-on actions, such as public health notification of specified diseases or logging work-related conditions. Access control is via a single sign-on system that identifies the user and his user profile, thus enabling or disabling approved system privileges. Initially, some 40 profiles were defined that through usage have been expanded by the Department of Health to more than 60.

#### ***SIGA Project – Technology***

The SIGA Project initially invested US \$10 million in software and US \$50 million in project-related hardware and connectivity infrastructure. As much as possible, the project utilized open-standards, free-software and Java-based architecture for cost-reduction, platform-independence and the creation of a library of reusable software components.

While the system should run on a variety of equipment, a basic platform was defined using Linux as the standard operating system, JBoss as the application server and Oracle as the database management system. The only proprietary software chosen was Oracle, as no free-software database management system was considered suitable for the task. The system was developed using a three-layer schema as depicted in Figure 1.

**SIGA Project - System Specification**

The system’s functionality specified using the Unified Process, based on use cases. and experts were assembled forums to review and improve use cases as well as propose ones. A trained health informatician led the forum meetings with the aim of identifying and recording all necessary use cases. Once implemented, cases were validated by comparing their operation with use case’s description. In order to allow for full information integration, a conceptual information model was devised to cope with the complexity of the domain. The schematic representation of this model can be seen in Figure 2.

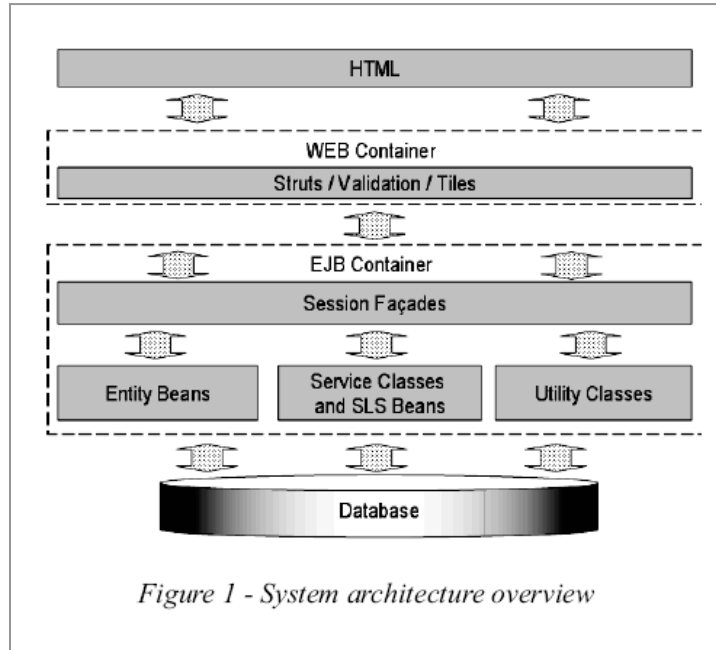


Figure 1 - System architecture overview

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**SIGA Project - Results and Steps**

As of May, 2008, 14,301,383 registered users produced records on 1,017,463 primary care visits month, 189,393 specialized consultations per month, 1,738,807 retail prescriptions month, and 35,000 authorizations of high cost complex procedures per month. The project resulted in a 30 percent reduction in the waiting time for specialized

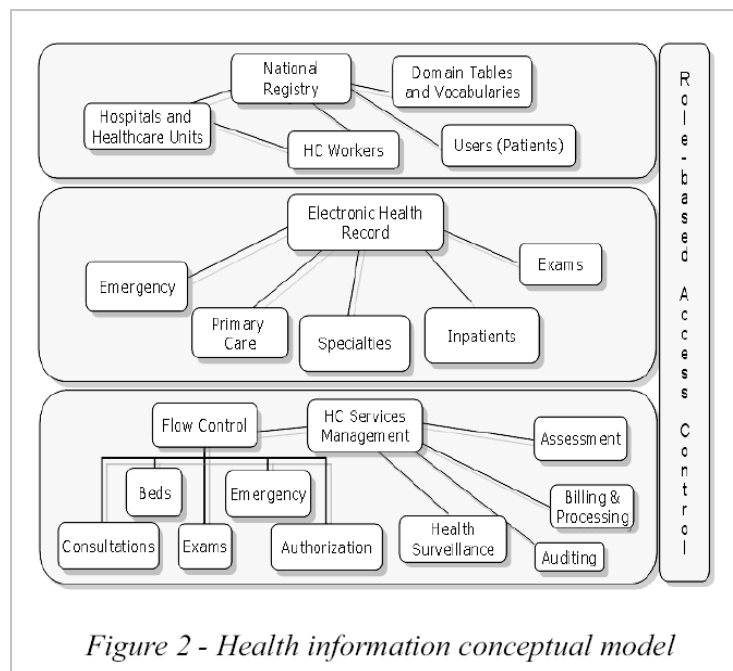


Figure 2 - Health information conceptual model

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consultations and procedures.

As of this writing, SIGA Saúde is in use in 372 primary care units. In 2009, the project began a reevaluation phase in preparation for the full implementation of the EHR. SIGA Saúde has also been installed in the São Paulo State Department of Health to help identify and control the flow of patients with hemophilia or being treated with hemodialysis.

### **Integrated Healthcare System - Federal District Government of Brasilia**

Brasilia, the Federal District (FD) of Brazil, is in the midst of an ambitious three-year project to modernize the delivery and administration of healthcare in the city. The GDF Health Secretary started implementing an EHR project in 2005. When complete, the Integrated GDF Healthcare System will connect all the healthcare centers, diagnostic laboratories, public pharmacies, and hospitals of the FD. It will also interface with national programs run by Brazil's Department of Health.

Each of the FD's 2,5 million residents will be issued a "Citizen's Health Card" that grants instant, secure access to all of their personal medical files. Since 2005, the FD has invested R \$6 million in the project. Thanks to software modular architecture, the District Government is already seeing significant cost savings and improved quality-of-care from the portions of the project that have been completed. One project example is the "Test Portal" that allows patients and their doctors to access the results of laboratory tests over the Internet. So far, the Test Portal has been implemented at the Hospital de Base (one of the main hospitals of the Brasília city), several regional hospitals, and the Central Laboratory itself. Together, these hospitals account for 5.5 million of the more than eight million laboratory tests performed each year in the FD. The company selected to implement this project is InterSystems Corporation.

GDF's Health Department estimates that the old paper-based system resulted in 20 percent loss of test results even before they could be reviewed by a doctor. Moreover, when doctors ordered repeat tests, 30 percent of those results were lost, resulting in R \$18 million wasted of the R \$60 million spent each year on testing. The Test Portal cuts waste close to zero by allowing users and/or healthcare professionals close to real time access to the complete patient record, including all laboratory test results. Additionally, with the old paper-based system, patients typically used to wait for 15 to 30 days to get their test results. Results are now available in less than a day.

Significant savings are also being realized by efficiently managing the purchase of medicines, which costs the FD nearly R \$220 million annually, with about 20 percent of these resources also lost because a result of waste or fraud (R \$40 million). Bed management is another area that is yielding cost reductions in FD. All of the care beds in Brasilia – found at 17 hospitals, of which 10 are public and 7 are private – are being regulated by the Government Project in real time. Brasilia has around 4,000 beds in its hospitals occupied by 2.3 patients per bed per month. The GDF's Health Department has a goal to double the occupation of each bed from 2.3 to 4.6 patients per month, and predicts that when the Integrated GDF Healthcare System is completely operational in three years, the total savings will reach R \$100 million per year.

One of the most highly anticipated stages of the Health Integration Project is the deployment of its Citizen Health Card system. A pilot project at the Gama Regional Hospital has issued health



cards to approximately 100,000 inhabitants of the region and will gradually rollout cards to all of Brasilia's 2.5 million residents, giving them secure access to a personal EHR. This Citizen Health Card is fully integrated with the SUS National Health Card.

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## CHILE

### Overview of Country Healthcare System

Chile is situated in the extreme southwest of South America, bordering Peru, Bolivia and Argentina. Its continental and insular surface area is 756,626 km<sup>2</sup>, and its Antarctic territory covers 1,250,000 km<sup>2</sup>. In June of 2008, Chile's population was 16,454,143 with a growth rate of 0.905 percent per year. The GDP (official exchange rate) is \$181.5 billion with real growth rate about four percent in 2008.

Chile's medical sector is small but extremely competitive. Currently, the country spends approximately seven percent of its GDP on healthcare.

### *Health System Organization*

#### Health Policies and Plans

Current health sector reforms were officially set in motion by a set of draft laws that the former Administration (2000–2006) submitted to the Parliament in 2002. The centerpiece of healthcare reform in Chile is the law that establishes the “Plan for Universal Access with Explicit Guarantees (the AUGE Plan)”<sup>107</sup> and a law that strengthens the health authority and generates the conditions whereby hospitals can be managed with greater flexibility.<sup>108</sup> The *AUGE Plan* specifies the following four basic guarantees for 56 health problems: access, timeliness, quality and financial protection.

A private health insurance system, ISAPRES, was developed alongside the state system and was intended to be the dominant one. A National Health Fund (FONASA) was created in 1979 as a public agency to collect and manage the financial resources coming from the following sources: (1) the compulsory contributions of employees who chose to remain in the public system or who could not afford an adequate plan with an ISAPRES company; and (2) from the national government's health budget.

The health policy framework and plans slated for the current Administration's term under President Michelle Bachelet (2006–2010) call for completing the implementation and strengthening of the aforementioned reforms. Specifically, this includes increasing the number of covered health problems under the AUGE Plan from 56 to 80 by 2010 (with the objective to reach until the end of 2008 with 62).

Chile's healthcare system is governed by regulations issued by the Ministry of Health (MINSAL), whose programs determine coverage levels, the frequency of contact between users and care providers, and the responsibilities inherent at each level of care in the health system. These regulations constitute mandatory frameworks for care at public and private health

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<sup>107</sup> The *AUGE Plan* was established by Law 19,966 and is known as the General System of Health Care Guarantees.

<sup>108</sup> This law is Law 19,937 that pertains to the Health Authority and Network of Autonomous Hospitals.

establishments, in agreement with the public sector, and represent a frame of reference for the organization of private-sector healthcare establishments.

In Chile, health services are a mixed system in terms of financing, health insurance, and service delivery. By law, all workers are required to pay seven percent of their monthly wages into public (FONASA) or private (ISAPREs) health insurance. In addition to contributions from its members, FONASA receives transfers from the Department of the Treasury to cover indigents and to carry out public health programs. The private insurance sector is represented by the ISAPREs, private health insurers that administer the obligatory contributions from wage earners; their members can pay additional premiums to improve their insurance plan coverage. The ISAPREs and FONASA are both overseen by the Office of the Health Superintendent.

The delivery of services also is mixed. The vast majority of primary care facilities are administered by the municipalities; hospitals fall under the responsibility of the Health Services. Law No. 19,937 provides for a network of autonomous hospitals that permits greater flexibility in the management of the country's 56 highly complex hospitals. In 2005, autonomy authorization was granted to five hospitals; by the end 2009, all 56 of the country's highly complex hospitals will be granted this authorization. In addition, there are a series of clinics, centers, laboratories and pharmacies that are managed by private individuals or companies. There are only a few not-for-profit non-governmental organizations, and their work is limited to some rural health centers and hospitals operated by religious organizations.

FONASA covers 68.3 percent of the population and the ISAPRE covers 17.6 percent. The remaining 14.1 percent is covered by other private plans (such as the armed forces plan) or has no insurance at all. Public health services must meet all demands for emergency services. Moreover, the public health programs (such as immunization and tuberculosis control) target the entire population, without discrimination.

### *Individual Care Services*

The public healthcare network is composed of outpatient and hospital facilities offering services of different complexity. They include 196 hospitals, 60 of which are high-complexity hospitals. There are 99 rural hospitals. Additionally, 14 private hospitals also are part of the network, providing services to persons covered by public insurance plans under a delegation agreement. The public outpatient network includes 594 primary healthcare centers: 258 general clinics located in urban areas and 151 rural clinics; 115 primary healthcare clinics attached to hospitals; and 70 family health centers. The country also operates 40 outpatient mental health centers; five health referral centers that offer services in four core medical specialties (internal medicine, pediatrics, surgery and gynecology/obstetrics); and five diagnostic and treatment centers or high-complexity outpatient facilities. The outpatient network also includes 1,165 rural health posts.

Emergency care is provided by hospital emergency services in hospitals and by emergency primary care services. The main private hospitals and clinics also offer emergency care. A prehospital emergency care system has been in place since the late 1990s; it includes rescue ambulances of different complexity and response capabilities, as well as a dispatching center. The system operates in the three most heavily populated regions (metropolitan Santiago,

Valparaíso and Bío-Bío); work is under way to extend it to the rest of the country. Auxiliary diagnostic and therapeutic services are offered by the public and private sectors.

### **Human Resources**

According to recent studies, the country has 25,542 practicing physicians, of whom 2,276 were trained abroad and directly accredited by the Ministry of Foreign Relations, while 963 are immigrants who have had their medical degrees reaccredited in Chile. Of them, 14,306, or 56 percent, are physicians certified in specialized areas of medicine. According to the College of Physicians, the country currently has 20,146 physicians although membership in the College of Physicians is not mandatory.

With respect to FONASA beneficiaries, there are 8.45 physicians per 10,000 population, and their distribution by region ranges from 6 to 16 physicians per 10,000 beneficiaries. The 12 faculties of medicine (nine public and three private) graduate about 600 new doctors a year. According to estimates, the country has 18,000 nurses, but only 8,000 work in the public sector. In 2004, there were roughly 60,000 professionals, technicians, and health assistants in the public sector, and one nurse for every three physicians. In that year, the public health sector employed 90,000 people, indicating that administrative and service staff accounted for one-third of the total.

### **General ICT Indicators**

Under the current administration, the Chilean ICT development vision is facing some controversy, although there is a *Digital Development Strategy 2007-2012* that sets 25 objectives and goals to promote the effective use of technology.

Statistics indicate that almost 30 percent of Chileans have access to a computer with an Internet connection on a daily basis in their homes, workplaces, schools or public centers (such as cybercafés). A recent telecommunications consumer survey showed that 1,405,510 Chilean households had access to fixed-line connections to the Internet and one in every three homes had access to broadband by June 2008.<sup>109</sup> Moreover, 79 percent of Internet users access it in their

homes, 53.1 percent at cybercafés, 50.5 percent at their workplaces and 28.1 percent at their schools.

<b>ICT services in Chilean households</b>	
<b>Service</b>	<b>Total</b>
Telephone	54.5%
Long-distance telephone service (carrier)	7.8%
Mobile phone (prepaid or with contract)	89.5%
Internet connection	28.5%
TV (cable/satellite)	33.5%
None of the services	1.0%
<i>Source: SUBTEL (2008)</i>	

In the 2008 Information Society Index developed by the International Data Corporation (IDC), Chile retained its position as the country with the highest scores in Latin America. The index is based on variables like personal computer ownership, Internet access and

telecommunications services, as well as social variables such as education. Chile ranked 29th overall out of the 53 countries studied worldwide and 26th with regard to Internet access.

After one and a half years without a digital agenda, the Bachelet government launched the new Digital Strategy 2007-2012 in January 2008. The strategy was developed through a public participation process that included the input of citizens, professionals, consultants, activists and civil society organizations. The process included a blog where people could post comments, proposals and contributions over a one-month period. The main objective of the Digital Strategy is to “contribute to Chile’s economic and social development by means of the potential offered by the use of [ICTs] to improve the quality of education, increase transparency, productivity and competitiveness, and provide better governance through greater citizen participation and commitment.”

The government has acknowledged the importance of information and communication technologies for Chile’s development and has consequently implemented a number of policies in various areas. The Bachelet Administration created an institutional framework entitled the *Committee of Ministers for Digital*. This committee, created in February 2007, is the body responsible for the design and implementation of public policies to promote a deeper and more intensive use of information and communication technologies for citizens, businesses and the state.

Chile is facing new challenges in e-government that have to do with interoperability, shared services and multi-sector platforms, all in the search for providing services with more value added to citizens. It will be necessary to keep advancing in the modernization of public administration and innovate in new modalities of interaction with citizens, especially in priority services such as health, social security, justice and local governments (i.e., municipalities).

### ***National EHR Program***

The health sector will center its efforts in IS implementation in areas that improve customer service as well as the management of the health center network.

The following developments are highlighted:

#### *Service Schedules*

- Implement a system that allows citizens to visualize health center schedules, highlighting vacancies in particular. It will also show scheduling details for medical appointments, procedures, group activities and waiting lists.

#### *Management of Medical Appointments and Procedures*

- Administer the granting of hours or time slots for health services, both for medical consultations and for procedures or diagnostic exams, as well as the transfer of clinical information among the different service levels.

### *Patient Management*

- Register and report the different movements of patients, allowing the management and administration of beds per wing, floor, nurse module and wards.

### *Information System for Urgencies*

- Have a register system that allows hospital staff to obtain relevant data of emergency services on line.

The government's initiatives or projects for the ICT in the Healthcare Sector, introduced in 2007 by the Ministry of Health (Minsal), are as follows:

- ***Minsal Net (Rede Minsal)***
  - *Sectorial Intranet (Salunet)*: Enables a virtual space of accessible work to all the organisms integrated in the Net Minsal, allowing to spread all the important information for the performance of the sector, exchange documentation, establish working groups around specific themes, and to develop e-learning programs among others important aspects.
  - *Institutional Web Portal*: The project enables a virtual space of access to the external community, allowing to the sector spread important information for the beneficiary population, health and universities institutions, among others.
  - *Video Conferences Net*: This project provides conference video rooms to the Health Managers of the several medical units (e.g., 28 Health Services, 13 Seremis of Health, Fonasa, ISP, Cenabast) with the purpose supporting the management activities of the several institutions.
- ***EHR for the Primary Care*** (“RCE - Registro Clínico Electrónico - Atención Primaria de Salud”): Records set that contain the data, values and all the information that involves patient's clinical evolution when he passes by healthcare chain. It is in digital format, with independence of where and when the record was generated and is part of an IS that allows permanent accessibility, with safety and confidentiality.
- ***Integration Platform***: software's structure that began operation in July 2007 aiming to simplify the creation and management of interfaces between different types of application in Chile Healthcare Systems.
- ***ICARO System***: A current IS operation for pre-hospital care, known as SAMU 133, that integrates various technological components that exist in the center of the regulatory system: telephone, radio, and GPS data.
- ***Information System for Network Care (SIRA - Sistema de Información para la Red Asistencial)***: From a technological perspective, this IS is defined as an ecosystem of applications – national in scope, flexible and adaptable to the operation of networks of

care, previously defined information standards and technology. Will complement and make interoperable technology solutions.

- **Digital Imaging System for the Experimental Hospital Padre Alberto Hurtado:** The system is in operation at the hospital in order to optimize patient care access to imaging tests. Procedures are defined and productivity improved, based on the incorporation of digital technology and IT processes to radiology.
- **Virtual Visit (Visita Virtual):** It's a tool that enables a virtual visit, through digital technology, between the patient/family and health teams. It operates through a video conferencing system mounted on a "car technology," that is equipped with a PC, a Webcam, a headset and Access Point. On the community side, the families have access to the virtual visit from different places (Telecentres, Infocentres, Schools and Libraries) with the necessary ICT/equipment, in addition to an operator and/or coordinator trained to support the family in establishing the connection to the hospital. Describes the pilot work at the Hospital of Temuco.

#### Chile - Summary of the projects and initiatives in Health - 2007

<b>Initiatives for Habilitation</b>	<i>Integration Platform</i>	Software's structure that began operation in July 2007 aiming to simplify the creation and management of interfaces between different types of application.
	<i>Equipment renewal</i>	In 2007, started the process of bidding for a total of 10,500 equipment computational for the various units of Minsal. In 2009, will have 20,000 equipment.
	<i>Minsal Net (rede Minsal)</i>	≠ Sectorial Intranet (Salunet) ≠ Portal Web ≠ Video Conferences Net
<b>Initiatives to the strengthening of the Health Authority</b>	<i>Transmission in Line ("Trámite en Línea")</i>	The "Trámite en Línea" began its operation in July 2007 in the Metropolitan Area. Allows individual persons or companies to transmit health information relevant to by the Internet, by promoting the productivity and competitiveness in firms.
	<i>Disease Surveillance System ("SIVEP - Sistema de Vigilancia de Enfermedades de las Personas")</i>	Applications that will help improve the quality of the existing disease surveillance system of the people.
<b>Initiatives to improve the</b>	<i>Information System for Network Care ("SIRA -</i>	From a technological perspective, this information system is defined as an

<p><b>management of Assistance Networks</b></p>	<p><i>Sistema de Información para la Red Asistencial”)</i></p>	<p>ecosystem of applications, national in scope, flexible and adaptable to the operation of networks of care, previously defined information’s standards and technology. Will complement and make interoperable technology solutions. SIRA is a ministerial initiative, promoted by the Division of Network Management Assistance (DIGERA - División de Gestión de la Red Asistencial), Department of Statistics and Health Information (DEIS - Departamento de Estadísticas e Información de Salud) and the Department of Health Digital Agenda (Dades - Departamento de Agenda Digital en Salud ).</p>
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## **NORTH AMERICA**

### **CANADA**

#### **Overview of Country Healthcare System**

Canada has a predominantly publicly financed and administered healthcare system with 13 interlocking provincial and territorial health insurance plans. The system is designed to ensure that all eligible residents have universal access to medically necessary hospital and physician services, regardless of age or income and without direct charges at the point of service. Adopted in 1984, the Canada Health Act (CHA) defines the national principles, symbolic of the underlying values of equality and solidarity that govern the healthcare system. These principles call for a system that is:

- Publicly administered
- Comprehensive
- Universal
- Portable
- Accessible

While the CHA sets out the criteria and conditions that the 13 jurisdictions must satisfy in order to qualify for their full share of available funding, the provincial and territorial governments have primary jurisdiction over healthcare services. They set their own priorities, administer their budgets and manage their own resources. One exception is the responsibility for Aboriginal (First Nations people and Inuit) health services, which is shared by federal, provincial and territorial governments as well as Aboriginal organizations. The federal government also provides direct delivery of healthcare to other specific groups, including serving members of the Canadian Forces, the Royal Canadian Mounted Police and eligible veterans.<sup>1</sup> Many other organizations and groups, including health professional associations and accreditation, education, research and voluntary organizations, contribute to healthcare in Canada.

Few Canadian industries compare in size and complexity to Canada's public healthcare sector. More than 100 health regions, 900 hospitals, thousands of clinics and physician offices and a healthcare workforce of approximately 400,000 coordinate care delivery for a population of just over 33 million. Healthcare is also one of the country's most information-intensive industries with approximately 2,000 healthcare transactions per minute, all requiring documentation and information sharing. Each year, the system generates:

- 440 million laboratory tests
- 382 million prescriptions
- 322 million office-based physician visits
- 35 million diagnostic images
- 2.8 million in-patient hospitalizations

While healthcare is often defined as a core value of Canadian society, the system has come under stress in recent years due to various factors, including:<sup>2,3</sup>

- Aging population: one Canadian in five will be 65 years old by 2026;
- Shortage of physicians, in particular general practitioners and some specialists such as radiologists and oncologists: creating a sporadic pattern of care across channels;
- Care settings: continue to shift from acute to home care and other alternatives; and
- Rising costs: healthcare costs were expected to exceed \$160 billion CAD in 2007.

Canada's EHR initiative aims to use e-health solutions to address these factors as well as issues such as reducing wait times and adverse drug events, elimination of duplicated laboratory tests and diagnostic imaging scans, delays in access to diagnosis and treatment caused by incomplete health records. When practitioners have access to accurate up-to-date information their ability to serve the Canadian population's healthcare needs will improve immeasurably.

*Infoway* and the organization's jurisdictional partners took significant steps during 2008/09 to help empower consumers with their health records. Recognizing that developments in consumer health solutions are moving quickly, Canada's federal, provincial and territorial health ministers expressed support for *Infoway's* plans to discuss personal health record solutions with EHR vendors with the aim of exploring how their technologies could be made available to Canadians in a secure manner.

Furthermore, *Infoway* has announced a new certification service to developers of consumer health solutions. This service will provide them with greater market access, improve the quality of products developed, and enhance testing efficiencies. Conversely organizations investing in *Infoway*-certified solutions can enjoy a higher degree of confidence that the products they purchase are reliable, interoperable, private and secure.

## **National EHR Program**

### ***National IT/ICT Status & Strategy***

Despite the challenges listed above, Canadians have high expectations from their healthcare system. They want accurate, portable information; communication between their various e-providers; privacy protection; input into decisions; mitigation of risk; access to test/lab results; and timely access to appropriate care. An EHR can fulfill these expectations.

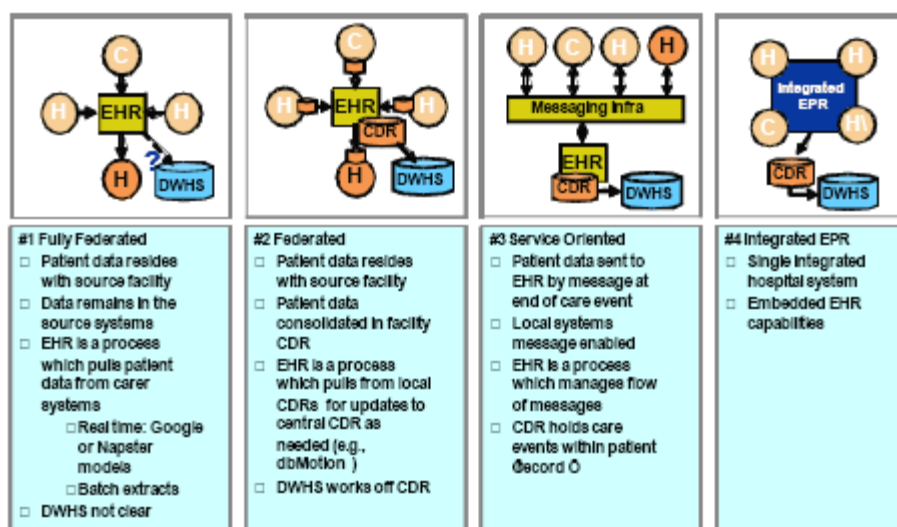
Recognizing the importance of an EHR, the federal government established Canada Health Infoway Inc. (*Infoway*) in 2001 to support and accelerate the development and adoption of interoperable EHR solutions across Canada. *Infoway* is an independent, not-for-profit organization whose members are Canada's federal, provincial and territorial deputy ministers of health. Its goal is that by 2010, every province and territory and the populations they serve will benefit from new health information systems that will help transform their healthcare system. Further, by 2010, 50 percent of Canadians and by 2016, 100 percent of Canadians will have their EHR available to their authorized professionals who provide their healthcare services.

## National/Regional EHR Approach

The national approach taken by *Infoway* to establishing an EHR in Canada was centered on providing an overall architecture for a national system (the EHRs Blueprint) and establishing the standards required to connect to a national network and exchange information. The focus has been on major points of services such as hospitals, community pharmacy, laboratory, and diagnostic imaging linking to an interoperable and shared EHR. This top down approach has given Canada a framework within which to build its national EHR. This step was taken to avoid multiple development of incompatible EHR systems across the nation that could result in lacking interconnectivity and thereby creating a patchwork system with no overlying national direction or standards for operation and development.

According to the given typology (see chart below), Canada's approach is primarily #3 Service Oriented. The services are defined within a common framework, the *Electronic Health Record Solution (EHRs) Blueprint* (See **Technology** below). The *EHRs Blueprint*:

- Is a flexible business and technical design framework that allows solutions, components and business rules to be reused by multiple applications in the health IT enterprise.
- Ensures that all EHR solutions can seamlessly and securely exchange patient health information.
- Addresses the business architecture, the conceptual architecture, the logical architecture, deployment models and potential applications in a health ecosystem.



Overall there are three main elements to the national EHR approach led by *Infoway*:

1. **Strategic investor:** *Infoway* works in collaboration with the federal/provincial/territorial jurisdictions, regional healthcare authorities, other healthcare organizations and IT vendors and suppliers to identify investment opportunities. Once investment decisions are made, its public sector partners lead the development, implementation and use of EHR solutions. *Infoway* provides leadership by establishing a strategic direction for EHR.

2. **Gated funding:** *Infoway* co-invests an average of 75 percent of eligible planning and implementation costs for approved projects, with the provinces and territories funding the balance. To manage risk, it uses a “gated” funding model that ties reimbursement to the achievement of specific implementation milestones, including end-user adoption by clinicians.
3. **Interoperability:** *Infoway* promotes the use of common architecture and standards to ensure that systems can interoperate so that data can not only be shared over distance, but also read and understood. A comprehensive EHR can bring together all elements of personal health information to provide a complete profile to facilitate diagnosis, quality outcomes, patient safety, health system deliver efficiency and speed access to care. This has led to the development of *Infoway*’s EHRS Blueprint and a portfolio of interoperability standards (e.g., HL7 v3, SNOMED CT<sup>®</sup>), which has been adopted by all of Canada’s health jurisdictions.

In addition, *Infoway* has established a national function called the *Infoway* Standards Collaborative (SC), a coordination function created to develop, support and sustain health information standards. It is responsible for implementation support, education, conformance and maintenance of EHR standards currently being developed by *Infoway*. The SC is also responsible for several standards initiatives including the Partnership (semi-annual plenary and meetings on standards and architecture), HL7 Canada, Canada’s participation in DICOM, LOINC<sup>®</sup> (Logical Observation Identifiers Names and Codes), SNOMED CT, and, in conjunction with the Canadian Standards Association (CSA), the secretariat to the Canadian Advisory Committee to the International Organization for Standardization (ISO)/TC 215.

## **EHR Governance**

### ***Legal/Regulatory***

Security and privacy are essential elements of EHRS. They are addressed together in the EHRI Privacy and Security Conceptual Architecture, Version 1.1, June 2005, and in Version 2 of the Blueprint released in 2006. In Canada, privacy is addressed in many federal/provincial/territorial general privacy and healthcare specific privacy laws. The features included in the architecture are based on requirements set out in legislation. These include provisions governing collection, use and disclosure of patient health information as well as patient access to their electronic health data.” Moreover, *Infoway* requires that privacy impact assessments be undertaken on all projects that receive funding and involve personal health information. This provides assurance that the project sponsor considers privacy and security throughout all stages of the project.

Currently, patient informational consent (express, implied, deemed or no consent) for the collection, use and disclosure of Personal Health Information varies by jurisdiction. Generally, health information may be collected, used and disclosed on the basis of implied consent. Legislation sets out a list of secondary uses that are permitted without consent. These include activities such as healthcare administration and management. Information for research purposes will often require express consent unless certain conditions, set out in legislation, are met. These conditions typically require that research be reviewed by an ethics board.

## ***Healthcare Policy in Canada***

The concept of an interoperable pan-Canadian EHR is in accordance with the four patient-oriented principles in the Canada Health Act:

1. **Universality:** Public healthcare insurance must be provided to all Canadians.
2. **Comprehensiveness:** Guarantees that all medically necessary hospital and doctor services are covered by public healthcare insurance.
3. **Accessibility:** Financial barriers to the provision of publicly funded health services, such as user charges, are discouraged, so that care is available to all Canadians regardless of income.
4. **Portability:** All Canadians are covered under public healthcare insurance when they travel within Canada or move from one province to another.<sup>4</sup>

When fully functional, the EHR will be in alignment with this policy. It will also support the government's commitment to its two overarching objectives for healthcare in Canada:

- To ensure that all Canadians have timely access to medically necessary health services regardless of their ability to pay for these services; and
- To ensure that no Canadian suffers undue financial hardship as a result of having to pay healthcare bills.

Implicit in these two objectives, particularly in the former, is the requirement that the medically necessary services provided under Canada's healthcare system be of high quality. The EHR will serve to enhance healthcare providers' contribution towards diagnosis and speed access to quality care.

## ***EHR Financing***

To date, *Infoway* has received a total of \$2.1 billion CAN in funding from the federal government. Its initial funding was \$500 million in 2001. In 2003, another \$500 million was allocated towards the core EHR and \$100 million towards Telehealth. In 2004, the federal government added \$100 million for the development of a pan-Canadian public health surveillance system. *Infoway* received \$400 million CAD in 2007 to support its EHR programs and solutions that further reduce patient wait times. In the January 2009 federal budget, *Infoway* was awarded an additional \$500 million to support the goal of having 50 percent of Canadians with an electronic health record by 2010. In addition, this funding will be used to speed up the implementation of electronic medical record systems for physicians and integration of points of service systems in hospitals, pharmacies and community care facilities into the EHR. This funding will also be targeted at consumer health solutions. *Infoway* funds 75 percent of approved projects and the disbursement uses a gated system of payments for milestones achieved. This approach ensures project accountability based on progress, implementation and adoption by end users.

## **Technology**

*Infoway's* EHRS Blueprint is the framework for the Canadian EHR solution; it provides the enterprise system architecture that guides overall development of the whole and the individual parts. The building blocks include: registries that uniquely identify individual patients/clients as well as health service providers; shared repositories of patient-centric health information; software applications used at the points where health services are provided (point of service applications); health information management services that coordinate the placement and retrieval of data in the shared repositories; and a standards-based communications layer that uniformly authenticates software applications and systems users who interoperate with the EHR.

The Blueprint is the conceptual architecture for the interoperable EHR that puts the right information about the right person in the hands of the right people at the right time and place. It is achieved by creating a robust and extensible framework and standards for sharing health information. This supports a broad range of current healthcare processes and is flexible enough to accommodate improvements and developments in best practices.

The architecture is also technology-neutral. It does not mandate the use of a particular technology, product or vendor service but simply describes how the system should work. In a best-of-breed approach, however, any application selected by the jurisdictions for their projects must be compliant with the Blueprint and with the interoperability standards. This principle, and the use of standards-based commercial solutions that reduce cost and risk, is part of *Infoway's* business strategy.

All jurisdictions in Canada have aligned themselves to the *Infoway* Blueprint as the national architecture for an interoperable EHR. *Infoway* works with the jurisdictions on strategies, plans, scope and costing and funds those projects as they implement the various elements of the EHR: diagnostic imaging, drug and lab information systems, client and provider registries, etc. As each province and territory develops their electronic health solutions, they are expected to do so in compliance with the *Infoway*-developed and/or identified standards required to achieve interoperability. By providing the architecture and the necessary standards, *Infoway* is providing the overall framework for the EHR.

## **Adoption**

Clinician adoption is key to EHR implementation and involves change management in the clinical setting in conjunction with a number of initiatives to promote adoption. Fifty percent of funding for implementation projects is reserved for achievement of adoption targets, placing a significant emphasis on clinical utilization. For example, following the implementation of the Drug Profile Viewer in 175 emergency departments in Ontario, a follow-up survey showed barriers to adoption included multiple passwords, workflow and training. By identifying these change management issues through best practices, follow-up training and support, adoption momentum was restored and targets met prior to the timeline.

Lessons learned point to the following issues in achieving successful adoption:

- Involve clinicians in all aspects of the project, from requirements definition to implementation. Demonstrate active response to clinician input and concerns.

- Ensure there is support through all levels of management and an enabling governance structure.
- Understand what motivates clinicians to adopt: Patient safety? Innovation? Efficiency? Provide evidence of EHR solutions effectiveness and a value proposition.
- Define the desired impact on workflow, and ensure that technical implementation supports workflow enhancements.
- Engage and encourage clinician “champions” and clearly define their roles to facilitate successful adoption of EHR solutions.
- Provide a flexible offering of pre- and post-implementation support to best meet physician needs and ensure rapid solution uptake (e.g., 1:1 training).
- Set targets for adoption and monitor them on a regular basis, refocusing change management tactics as required.
- Measure benefits and impacts: this helps projects remain focused on being clinically relevant and the benefits realized in early implementation will motivate latent adopters.
- Manage expectations through effective communication via multiple channels and forums with effective, transparent messages targeted to the clinician audience and other key stakeholders.

## Outcomes

Since its inception, *Infoway* has approved more than 276 projects in the following targeted program areas: Diagnostic Imaging Systems, Drug Information Systems, Infostructure, Innovation and Adoption, Interoperable EHR, Laboratory Information Systems, Public Health Surveillance, Registries, Telehealth and Patient Access to Quality Care. Of the 276 projects approved as of the end of the third quarter of *Infoway*'s 2008-2009 fiscal year, 151 were active and 125 complete. The majority of the projects, 176, were undertaken jointly with the provinces and territories and 100 active or complete projects were pan-Canadian. *Infoway* expects to reach its goals of an EHR for 50 percent of Canadians by the end of 2010 and for 100 percent of Canadians by 2016.

## Benefits

According to Booz Allen Hamilton's report,<sup>5</sup> completion of the pan-Canadian EHR will result in a capital cost of \$10 to \$12 billion CAN over 10 years with expected annual savings of \$6 to \$7 billion CAN upon full implementation.

Cumulative benefits to Canadians are expected to be the following:

- Increased patient participation in care;
- Well-managed chronic illness (Disease Management);
- Improved access to care in remote and rural communities;
- Fewer adverse drug events;
- Better prescribing practices;
- Reduction in duplicate or unnecessary tests;
- Reduced wait times; and

- Lives saved.

One area in which benefits are now clearly definable is Diagnostic Imaging (DI). By creating a shared Picture Archiving and Communications System (PACS), groups of hospitals can share the cost of building a repository for digital diagnostic images. A recent study examining the pan-Canadian impacts of these investments included findings of:

- Increased radiologist productivity to a level equivalent to adding more than 500 radiologists to Canada's healthcare system;
- 25 to 30 percent increase in technologists' productivity;
- Elimination of up to 17,000 patient transfers annually through remote access to images;
- 30-40-percent improvement in Turnaround Times (the process time from patient check-in or registration in Diagnostic Imaging to when report is available on the system to the referring physician); and
- Remote reporting enabling 30-40% of Canadian radiologists to support care delivery and improve access for remote geographies and populations.

Overall, the study estimated \$1 billion a year in health system savings and efficiencies once PACS is fully implemented across the country.

### ***Implementation Experiences***

*Infoway's* approach to creating a pan-Canadian EHR has been to leverage knowledge gleaned from individual projects. For example, early diagnostic imaging projects in British Columbia and Ontario provided essential feedback for replication of similar projects. In turn, each replicated project produces information that benefits the replication of future projects. This reduces ramp-up time on a project by providing a "blueprint" to follow. Reuse and replicate have been key strategies for *Infoway*, with many of its projects in 2008 progressing to the implementation phase.

Examples of successes from across Canada:

- **Prince Edward Island and Ontario:** Seniors arriving at a hospital emergency room can have their prescription medication profile retrieved instantly.
- **Manitoba and New Brunswick:** Expanded telehealth services connect patients and specialists through high-speed networks, reducing delays, costs and stress.
- **Saskatchewan:** A pharmacy information network gives healthcare providers their patients' complete pharmacy dispensing history – electronically.
- **Alberta:** Chronically ill diabetic patients have collaborative care – from a diverse team of specialists who monitor, communicate and make decisions based on a complete and readily available EHR.
- **British Columbia, Quebec, Nova Scotia and Newfoundland:** A patient's MRI can be digitally captured and electronically downloaded for interpretation by an available radiologist almost anywhere in the province. In fact, a similar system has helped a B.C. health authority cut turnaround time for radiologists' reports by 41 percent.
- **Northwest Territories, Yukon and Nunavut:** Telehealth services are overcoming the problems associated with distance and accessibility to healthcare services by electronically linking patients with clinicians a long distance away. These three sparsely



populated territories are also benefiting by leveraging e-health systems and resources in place in larger jurisdictions to the south.

### **Next Steps – Vision 2015**

Despite the fact that implementation is already underway across the country and all jurisdictions have some components of the infostructure in place, Canada's journey to establish a fully interoperable EHR is far from complete. There are still hurdles to overcome, including clinician adoption/patient engagement, jurisdictional capacity to implement the required project and systems, achieving total interoperability, vendor adoption of common standards and architecture and, most importantly, recapitalization of *Infoway* to assist in funding the full EHR.

In 2006, more than 100 healthcare stakeholders across Canada, including deputy ministers and health region executives, hospital CEOs and CIOs, clinicians, patients, health associations and government agencies were asked for their input as part of a vision development exercise undertaken by *Infoway*. What emerged was a comprehensive vision to guide the next 10 years of investments in e-health investments, including the pursuit of four key initiatives:<sup>6</sup>

1. Complete the baseline EHR for all Canadians and extend its functionality and reach.
2. Articulate a strong business case for ongoing support and secure funding.
3. Bring key stakeholders (particularly public and front-line practitioners) on board.
4. Invest selectively in IT to enable the next level of "business needs."

Although *Infoway*'s current goal is centered on the year 2010, it is looking to 2016 as the potential date for achieving an interoperable, pan-Canadian EHR. It has developed the "Vision 2015," a plan for Canada's health infostructure. The "Vision 2015" balances priorities, ensuring that systems are integrated and can achieve lasting improvement in patient care, safety, access and healthcare productivity. The Vision 2015 is based on five priorities:

1. Finish what has been started in EHR and public health surveillance.
2. Implement EMRs in physician offices and physician order entry systems in hospitals.
3. Enable public visibility into wait times and access.
4. Facilitate patient self-care and empowerment through consumer health solutions.
5. Invest in advanced IT solutions to reduce wait times and for chronic disease management.

These priorities will drive the efforts of *Infoway* as it works toward full EHR implementation.

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