



Never ending stories of the development of an effective HIS in Thailand



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# Never ending stories of the development of an effective HIS in Thailand

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HIS in Thailand

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## Thai Health Information System: Situation and challenges

Dr. Pinij Faramnuayphal

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The World Health Organization (WHO) identifies fully functional health information system as one of the six important building blocks of high performing health system. A well-functioning health information system (HIS) is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status. All of these components contribute to a better health policy and planning, health resources allocation, health service delivery and finally, health outcome. The importance of health information system is crucial and is recognized that countries cannot build a good health system without it. Strengthening health information system, therefore, has become one of the most important issues worldwide in a recent decade. The demand on measuring the Millennium Development Goals is an example of the explicit requirements of having a well-functioning health information system globally.

### Complexity of HIS

At national level, Health information system is usually not structured as one single system but constructed from multiple sub-systems and requires a mechanism to draw the overall picture of country health information system in order to identify the gaps and overlaps in the system. However, commonly, this harmonizing mechanism is not well-established in a country as each sub-system has its own decision making authorities and mechanisms to force or encourage local level to collect data and deliver it to upper level as requested. However, some overlaps may be acceptable as well as maintaining some specific health information sub-systems as it is not possible and inappropriate to merge every sub-system into one. A big question is how to link all of these vertical systems to be complimentary to each other with least overlaps.

### Dilemma between top-down and bottom-up approach

The other issue is how HIS should be designed between top-down or bottom-up. An unavoidable conflict between local and central requirement is always considered, if HIS is designed centrally. Burden for local health personnel with unnecessarily additional overlaps among many vertical systems will commonly observed, while local level doesn't recognize the benefits of collecting data but just sends it.

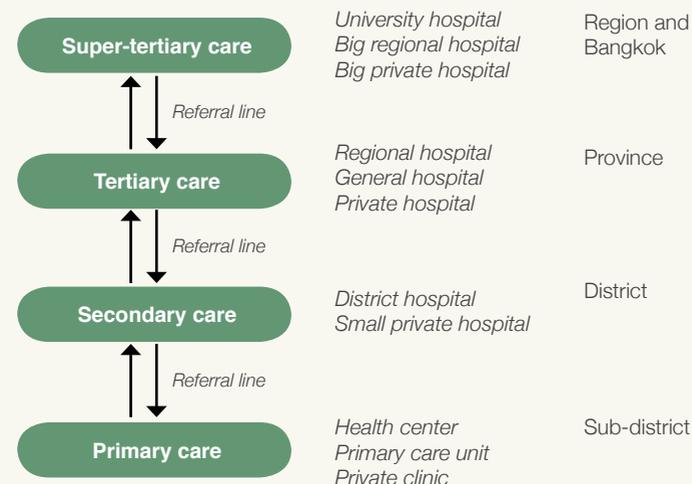
The other way round is the design of HIS from the bottom. This approach faces the main problem that if local level designs the system differently, how those systems can be merged at central level. This problem may be solved if the central level can define the minimum requirement for national level and allow diversity of the system design with additional requirements for each local area. However, the major obstacle is that, for all local facilities, they usually have different capacity to construct a good system and to collect good data. This unstandardized system will lead to a high volume of garbage in data or even no data if many local levels don't have good capacity and concern. Thailand has tried to balance both directions of system design through defining a standard dataset for transferring between local and central level and in the future optimizing data collection systems which are vertically designed by various health agencies.

### Thai Health Care System: a background

Health care system in Thailand is composed of at least three levels of care; primary, secondary, tertiary and super-tertiary. Primary care is normally located at sub-district (tambon) level namely "Health center" in rural district. Most of health centers have 3 health personnel without full-time medical doctor. Some health centers may have medical doctors working part-time in some days each week. In urban area of each province, many forms of "Primary Care Units (PCUs)" are established. Usually, medical doctors are assigned to work at PCUs in urban, some work full-time and some part-time. Most of PCUs in urban also assign multi-disciplinary mixture of health personnel such as pharmacist, nurse, public health personnel with a fully support of both resources and related services from provincial hospital. Secondary care is usually assigned to district hospitals located at each district. Medical doctors work full-time in hospital with basic investigation and in-patient facilities. Tertiary care is referred to provincial hospital in each province. Many types of specialists are

available at this level, mainly responsible for taking care of referred patient from district hospital. Some big hospitals especially for university hospital and regional hospital are defined as super-tertiary care with high level of medical technologies and equipments along with teaching and research function.

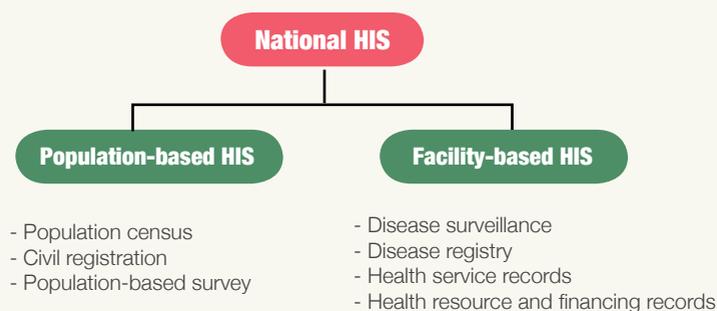
Picture 1: Level of care



### Thai Health Information System: the components

Considering methodology of data collection and representativeness of data, HIS may be classified into population-based health information system and facility-based health information system which are also defined in Health Metrics Network (HMN) framework. Population-based HIS refers to data collection platforms representing population including population census, civil registration, and population-based survey. Facility-based HIS refers to data collection platforms capturing health service-related data from health facilities including disease-based information and service activity-based information. However, classification of these two types may be not mutually exclusive as some of facility-based HIS might aim at covering overall population in their catchment area especially population data and prevention and promotion coverage data at primary care level as well as population-based disease registry.

**Picture 2: Major components of Health information sub-systems**



**Civil registration and mortality statistics: a foundation of HIS**

Civil registration system in Thailand was established many years ago. The death registration has been routinely used as the main source of mortality statistics evolving from paper-based data collection to electronic-based system. The online system has been nation-widely established and provides a timely mortality databases transferring from the Ministry of Interior to the Ministry of Public Health. Individual electronic mortality database is sent to the bureau of health policy and strategy on a monthly basis for adding ICD-10 code as the data for cause of death of each individual. The completeness is reasonably high except the early infant death. Unfortunately, the major gap of this system is a remaining high proportion of ill-defined and misclassified causes of death due to high proportion of mortality outside health facilities for which the causes of death is defined by head of the village without any medical background.

**Population-based survey: a common solution for population-based data**

Population-based survey becomes a very important source of data as most of the routine reporting systems face limitations to represent population where data captures only persons who seek care at facility

with possible biases and unreliability of reporting. Regularly, sampling surveys have been conducted by the National Statistical Office (NSO) covering socio-economic and health related topics. Health and Welfare survey is the main health-related survey conducted by NSO and used as basic information for calculating capitation rate for universal health care coverage in the beginning. The National Health Examination Survey is a costly survey providing information on prevalence of risk factors and chronic diseases with biomarker information. The provincial Behavior Risk Factors Surveillance System (BRFSS) is a platform providing provincial data on risk factors. Overlaps of some parameters exist across surveys but may use different level of detail which supposes to compliment to each other.

**Disease surveillance system: basic and essential information**

The original requirement of health information is for warning of epidemics and disease control. Disease surveillance system is designed and managed centrally but needs to expand data collection locally starting from the lowest level of care. The integrated disease surveillance system covering major communicable diseases is the main source of data informing disease epidemics pattern and trend in the whole country. Timeliness of data is crucial in terms of rapid response for occurring epidemics. Data transferring from lowest level may require a degree of lag time to central ministry. Data gathering and processing is managed centrally with electronic-based data transferring system and feedback is provided through many kinds of regular epidemiological reports.

**Disease registries: a platform for chronic diseases**

As burden of diseases has evolved overtime, information on non-communicable diseases become a major requirement for measuring size and pattern of disease distribution and trend. Thailand has implemented cancer registry for many years. The population-based cancer registry is the main data source informing incidence of cancer as well as survival probability. Thirteen provincial sites of cancer registry have been recently implemented to represent regional situation and trend. The other specific disease registries are currently being developed with a contribution from financial incentives related to payment mechanism in universal coverage insurance system.

### Health service statistics and a drive from universal health care coverage

The upcoming main source of health service statistics is electronic health records from all levels of health care facilities. This system has evolved from the basic routine monthly reports which collect aggregated data through report form. The newly implemented system has been developed according to the condition of payment system in universal coverage insurance which requires individual patient data for calculating relative weight of each Diagnosis Related Group (DRG). Such financial incentive is influential and pushes public and private hospitals who are involved in the insurance system send individual inpatient data for reimbursement. A standard dataset for hospital namely "standard 12 files" was endorsed as a requirement of central level and linked to case-based payment. A standard dataset for primary care level was also designed, endorsed and implemented so called "standard 18 files" with recently linked to financial incentive. The main factors that contribute to a possibility of implementing such system are availability of computer facility at all levels from biggest hospital to smallest health center, availability of software for data collection and maintenance, regularity of capacity building and auditing, and appropriate financial incentives with data quality verification. This system can be practically implemented even in the situation of having varieties of software used in health facilities by just informing software developer or vendor to insert a module to export those standard files into their applications.

### Hospital health records and ICT

At hospital level, varieties of software applications are used. There is no standard single software provided for every hospital. As a result, it is up to individual hospitals to choose which software they prefer. However, the problem occurs to some small hospitals where there are not many choices. Some small hospitals still require appropriate software at low cost of installation and maintenance. There are a few software vendors provide such conditions and not cover the majority. Diversity of software still exists and the central ministry has a little role to play. High level of information technology is available in many big hospitals. Some have rapidly developed their system to serve their clients and met international standard and expectation. The ICT advancement can be seen in university hospitals, big private hospitals and some regional hospitals.

### Primary care health records and ICT

Comparing with the hospital ICT, the ICT for primary care or health center level is much simpler. Even it is complex in terms of multiplicity of activities including prevention, promotion, and curative care with a requirement of measuring health service coverage and continuity of care, the software still less complex as it can be developed as a standalone system. There are some popular software developed by ICT division in central ministry which is used largely and some is developed by provincial health personnel themselves. Maintenance of software is manageable as local health personnel especially at provincial level have been built their capacity to adapt the system in some extent. However, the major problem of this system is the completeness and quality of data. The essential factor of success or failure should be the concern of local health personnel in updating the data and using the data to improve their services which need to be continuously monitored and improved.

### HIS Challenges: now and then

As informed above, there are many challenges in terms of improving completeness and data quality, gathering data from private providers, standardizing and harmonizing the multiple data collection systems. The most difficult challenge is harmonization of the system where the gaps and overlaps in the system should be minimized. Thailand has implemented many systems related to HIS but historically can do just little integration especially for an integration across health agencies. A secure collaboration and appropriate design of the system serving all demands is actually challenging.

### The way forward: from plan to implementation

As mentioned, harmonization of the system is problematic. Thailand has tried, therefore, to move to the direction of establishing the national mechanism. With a backup from the National Health Act, B.E. 2550, health information system is concerned as one component of health system. Recently, "National health information system development strategic plan" is in the process of approval and endorsement through issue-specific health assembly. As a result, national health information system will be managed through collaboration among agencies and finally comes up with an appropriate harmonization mechanism and effective HIS with minimization of health information gaps and overlaps in the end of the plan.

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Demand Led Development  
of Hospital Information  
Communication Technology  
System (ICT)





## Demand Led Development of Hospital Information Communication Technology System (ICT)

Pornruedee Nitirat  
Thongsouy Sitanon

Hospital information system is one important component of national HIS. Hospital-based health information is an origin of many types of health information covering various objectives of use such as monitoring morbidity and mortality, measuring health system performance, and supporting specific disease management. The benefit of improving information system and ICT at hospital is mainly for improving hospital care itself. ICT should be applied in all departments in each hospital with real-time connectivity to serve data collection at the point of service. Saraburi hospital has developed ICT and implemented it effectively in various departments such as outpatient services, emergency services, excellence centers etc. The system consists of hospital, laboratory and management information system supporting both clinical practice and decision making for service process improvement.

### Saraburi Province at a Glance

Just a 108- kilometer drive from Bangkok towards the northeast, you will never miss Saraburi Province, the area considered a gateway to the northeastern region of Thailand. Saraburi has been an important city since ancient times. It is assumed to have been established in approximately 1549 during the reign of King Maha Chakkraphat of the Kingdom of Ayutthaya. With its long and unique history, Saraburi always impresses those who visit and even those who have just heard about its legend. Saraburi is a significant Junction City renowned for the valuable Buddha's footprint, Pa Sak Jolasid Dam, unique curry puffs and dairy products, and amazing golden sunflower fields.

Saraburi hospital, the 4<sup>th</sup> provincial hospital of Thailand, opened its door 55 years ago in Saraburi Province. As the growth of the economy and patient demand has increased, Saraburi hospital grew up and became the regional hospital with 700 patient beds. The hospital not only provides typical health services but also serves as a practicing unit for medical and nursing students from various universities and colleges. Moreover, Saraburi hospital is the excellence center of trauma, cancer, neonate, and cardiac.

Up to now, there have been six directors administering this hospital. Their efforts to bring goods to clients and hospital personnel have never been stopped. Under the leadership of the current director, Dr. Tiem Angsachol, Saraburi hospital is recognized by the Ministry of Public Health as an outstanding governmental hospital of information technology. Saraburi hospital becomes a center of interest for other hospitals in Thailand. The success of the hospital is verified with hospital accreditation achievement and a runner-up



*Saraburi Hospital at a Glance*



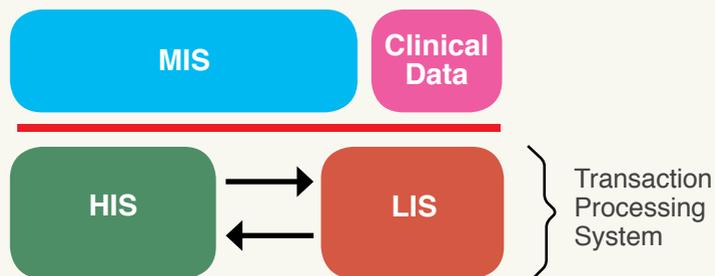
health promotion hospital award. Obviously, Dr. Angsachol and his approximate 2,500 staffs are pulling together to accomplish a shared vision of their hospital:

### Demands Led Development of Hospital ICT

The ICT has been developed at Saraburi Hospital since 1998. The Patient-centered care contributes to the development of hospital ICT since it was believed that ICT would be able to increase the quality of health services by retrieving data from the system, leading to timely caring for patients and making decision about health care using data and evidence. The current director strongly requires evidence and data in making his decisions. Before his arrival, Saraburi hospital did not have any organized information system. The existing data was useless for management purposes. Upon his arrival he indicated that the hospital had to have information systems that were aimed at providing current, accurate, complete, and well-organized data to support decisions in the hospital. Five main purposes to establish ICT comprise of increasing: operational efficiency, health service effectiveness, high quality services, the ability of competition, and opportunity in hospital business. After installing this program, data is now centralized, up-to-date, and ready to be used.

ICT consists of three current systems including Hospital Information System (HIS), Laboratory Information System (LIS), and Management Information System (MIS). The HIS and LIS are linked to each other (Figure 1).

**Figure 1: Information Systems, Saraburi Hospital, Saraburi Province, Thailand**



Data can flow back and forth between HIS and LIS so the two systems work together like a single system. The Management Information System (MIS) was developed in-house and the intranet has been used. Up to 600 workstations and 500 Dot Matrix Printers have been also installed to support this system. This program is also linked to all local hospitals in Saraburi Province in order to share health data in the area. Throughout 10 years of ICT introduction, it has been proved that ICT met with the main purposes of its operation. The founder is proud that decision making in the hospital is more reliable because of ICT innovation.

*"I am satisfied as overall ICT is practical. The system is ready to use and it is ready to be tested. When we want to make our decisions, we use data more than our feelings."* stated Dr. Anon Thaicharoen, founder and IT manager.

### How ICT works in Saraburi Hospital

There is no doubt that ICT is applicable to various sections all through the hospital and has shown its benefits such as the pay-for-performance scheme in wards project and the disease management for trauma, cancer, DM, Stroke, Acute coronary Syndrome.

Presented here are 4 examples to give you some ideas about how ICT works in this hospital.

#### Office of Medical Record

There are 5 units in this office including documentation, registration, record, practical activities, and statistics to handle an average of 2400 patients per day. Before applying ICT in this department, the process was not convenient to patients. It was time consuming to wait for their OPD card before



*"Saraburi Hospital is a High-Quality Hospital and a Health Services Leader in the Central Region of Thailand."*



going to meet with the doctor. ICT resolved this problem in the following way.

When patients request their OPD card, the staff will enter patient's information online. Another staff member sees the online information that has been sent and searches for the OPD card immediately. Entering health information is much faster than the traditional procedure because the information is electronically recorded and is always available to be used. Moreover, patients' information is updated daily, resulting in up-to-date existing data. Finally, inpatients' charges are scanned daily so that the information of each patient is electronically kept tighter. Therefore, when a patient comes back to the hospital, all previous health history and medical treatment are available to be utilized in making expedient decisions.

### Out-Patient Department of Surgery

A huge number of clients visit the Out-Patient Department of Surgery of Saraburi hospital everyday (an average of 213); whereas, only 4-5 surgeons and 4 nurses run the clinic each day. Due to time constraint and numerous clients, problems of data loss and doctors' unreadable handwriting occurred periodically and sometimes resulted in service mistakes. The surgeons that studies abroad and had exposure to hospitals equipped with ICT realized that it should be adopted within the department to fix existing problems. Hence, it is not surprising that about 2 years ago, the Out-Patient Department of Surgery was the first and the only OPD clinic formally cooperating with ICT. With ICT, treatments provided to patients are recorded in the system and any prescription will be directly sent to pharmacy department for in-advance medication preparation. The obvious benefits from ICT consist of 1) the ease of data searching, 2) the reduction of prescription errors, 3) data loss prevention after data entry, 4) the convenience and accuracy of appointment setting, and 5) data sharing between the clinic and wards.

### Emergency Room

In the past, when working without ICT, the emergency department had to request a patient history from the health record department and have it delivered in person. Now, the ICT has entered and patient data can be accessed electronically and there is less redundancy because there is one entry for all to use.

The referral online project is outstanding and is a highlight that visitors look forward to seeing when they are looking into how ICT is applied in referring patients among hospitals in the network. While transferring the patient, the receiver can communicate with the sender using phone or other available communication technology. More information can be provided via the online system upon request. This process clearly reduces waiting time. Treatment can be prepared promptly before the patient arrives at the ER.

Telemedicine will be also used in the emergency medical service to care for patients during the referral online system to ensure a high quality of care. Cameras are installed in the referring vehicle. Both senders and receivers are able to view and monitor as well as manage health problems during sending the patients to another hospital, ensuring patients' safety through the telemedicine channel.

### Integrated Data Management of Excellence Centers (ID-MEC)

As mentioned above, four excellence centers were established in Saraburi hospital. In addition, the hospital is a regional center of specific chronic diseases-lymphoma/leukemia, hemophilia, cleft lip and palate, stroke and continuous ambulatory peritoneal dialysis (CAPD). Data collected from each excellence center and the office of specific chronic diseases is abundant. Previously, data were recorded manually in paper form. With this method problems always occurred and data sharing and use among departments was limited and inconvenient. The Office of Integrated Data Management of Excellence Centers was launched around a year ago with the hope that it would be the best solution for data management. Data from all excellence centers and the office of specific





chronic diseases are sent to ID-MEC via ICT and will be managed to serve those who want to utilize it. A year after ID-MEC launched, it can be said that ID-MEC is a good answer for data recording and sharing. In terms of data sharing with health alliances, ID-MEC also exchanges data with other health settings including National Health Security Office, the Ministry of Public Health.

### Keys to Success

“Human factors” is the key to the success of ICT in Saraburi hospital. Three main human factors include leader’s vision, users’ attitude, and an adequate support team.

#### Leader’s Vision

Implementation of ICT is a hospital-wide project and implies change. The hospital director is considered both the change agent and change manager. It is not surprising that when asking about keys to success of ICT, the hospital director, Dr. Angsachol, is the first person that comes to mind. Dr. Angsachol began with his hope to improve the quality of health services provided to clients as well as the quality of life of hospital staff. He believed that ICT would be the best choice to fulfill his dream. Without any hesitation, he introduced this innovation and pushed forward his steering team. It can be claimed that Dr. Angsachol spearheaded getting ICT into Saraburi hospital and, without him it would have never become true.

*“Surely, it’s the hospital director, Dr. Angsachol. He greatly devoted himself to this thing [an ICT]. I accepted that he has a wide vision to use an ICT to lift up quality of work and competency of hospital staff,”* said the secretary of ID-MEC.

Sharing the same vision with Dr. Angsachol, Dr. Thaicharoen created ICT and has devoted himself to ICT ever since. He has tirelessly strove to improve the system though his work seems endless.

*“Everything happens these days because the hospital director has his public mind. We meet twice a week and he always tells us to care for our patients first. He focuses on our patients first and we share this vision. If we are able to do best for our patients, it will be useful for others in the long run”* said Dr. Thaicharoen.

#### Unlimited Support Team

How to suffer less from the innovation is a big challenge that contributes to the adoption of innovation. Since ICT is not always friendly and sometimes has functional disorder, a support team is definitely essential. It is incredible to learn that an unlimited support team in Saraburi hospital was formed to serve the system 24 hours a day 7 days a week and it works very well. Hospital staff agrees that the support team is trustable and always available for them when needed. For that reason, they feel greater confidence working with the system.

*“An effective system control and maintenance is very important. An IT team must take care of users like us. Our IT team is very supportive. They are available for us 24 hours. We can call them to get help anytime,”* said a pharmacist.

#### Attitude toward Innovation

The director indicated at the beginning of the ICT project that all hospital personnel are the most important element to maintain this ICT. At first. Some hospital staff did not feel comfortable to accept this innovation when it was initially promoted because they perceived some barriers. However, after they began to use it and became more familiar with it, they understood its importance and fell in love with it. The hospital administrators also enhance IT competency of all staff by providing them with training and knowledge sources. To date, staffs’ perceived benefits much outweigh their perceived barriers. This makes everybody willing to cooperate with ICT in the hospital.

*“Firstly, I thought it might kill lots of my time to put data into the system. Finally, I found that it helps save so much time when searching data. Now, I feel very good with it. It’s so convenient to get all*





*info about my patients-not only their disease but where they live and their family members as well. My work is much easier,”* said a nurse of the PCU Department.

### From Good to Great

At this moment, ICT has proven itself as an acceptable innovation in Thailand’s health arena. Still, the wish to reach a better point should not be limited. It is a fact that ICT has some room for improvement. These following suggestions should be taken into consideration.

#### Patient Centered

The ICT and health care providers have been well prepared to utilize ICT to deliver the best care. The most important aim in using ICT is to bring ICT close to patients so that every patient can receive the best health care services the providers can give. Many barriers impede patients from hospital care such as poverty and transportation difficulty, special hospital clinics should be implemented in local health settings to serve those outreach populations. An online clinic service provided by Saraburi hospital might be a good alternative. If any patients need to see a doctor, an appointment can be made via an online system. This way, patients can access faster quality care. A great example of being patient centered is proactive eye check ups for diabetes patients. Generally, Diabetes patients visit a primary care unit (PCU) in the community for medication and caring. Glaucoma surveillance among Diabetes patients is insufficiently done. Recently, there is an effort to apply high technology to take a picture of patients’ eyes (macula) at the PCU and upload those pictures to the ICT where an ophthalmologist can access them anywhere and anytime. Only patients who need further follow-up are asked to see a doctor at the hospital. It helps reduce costs and overcrowding at the hospital. A proactive eye check up project has just been started and there are some areas of improvement to overcome.

#### Workload Resolution

Information is strong enough to conclude that workload is a considerable barrier prohibiting the use of an ICT. Some informants pointed out that data entry is time consuming especially for those who have a limited computer skill. Consequently, hiring a data-entry person for each particular department should be taken into account to eliminate

this barrier. Initial investment into data entry may improve effectiveness of ICT and bring about workload reduction in the future. It implies good quality of service as well.

#### Information System Improvement

There is confidence in the statement that ICT in Saraburi hospital is beneficial for patients and hospital staff. Unfortunately, this conclusion has been made based on word of mouth without any evidence-based evaluation. A concrete evaluation should be made and this will be useful in terms of system enhancement and service improvement. What is more, an evaluation can help understand the effectiveness of the system and how it may be confidently generalized to other health settings.

Last but not least, Ministry of Public Health’s National Health Security Office (NHSO) also has its own nationwide ICT called “HOSxP”. This system is for any health setting to record and transfer health data to the office to receive monthly financial support. It would be wonderful if Saraburi hospital’s ICT and NHSO’s ICT could act in synergy. This would achieve two tasks in one stroke. It is worthwhile to dedicate time and resources to make this a reality.

In conclusion, as the world continues to progress, the duty of public health professionals to provide excellent quality care should never end. The information system of Saraburi hospital is a vital tool in helping fulfill that responsibility. Health-related innovation is a critical component to improving health and well being for Thais and the world population as a whole.

#### Acknowledgement

We would like to thank for the information and kindness given from Dr. Anon Thaicharoen, Saraburi Hospital.





Experiences of ICT development  
in highly advanced private hospitals





## Experiences of ICT development in highly advanced private hospitals

Peranan Jerayingmongkol

Private hospital is an important sector providing health care for people and is perceived as providing high quality of services. ICT development is also one component that can serve better health care in both standalone hospital and network of hospitals. Advancement of hospital information system can be observed in many hospitals; Bumrungrad International Hospital and Bangkok Hospital are the examples. Harmonized hospital information system is implemented including registration, clinical systems, patient bed management, patient diagnosis, laboratory data, radiology reports etc. along with some high technologies in health care such as pharmacy robot and some consultation services so-called tele-consultation services. Good practices in private hospitals can demonstrate the new frontiers in hospital information system and ICT with a potential to connect internationally.

## How ICT Affects Performance of Medical Hub of Asia

### Bumrungrad “Care for the people”

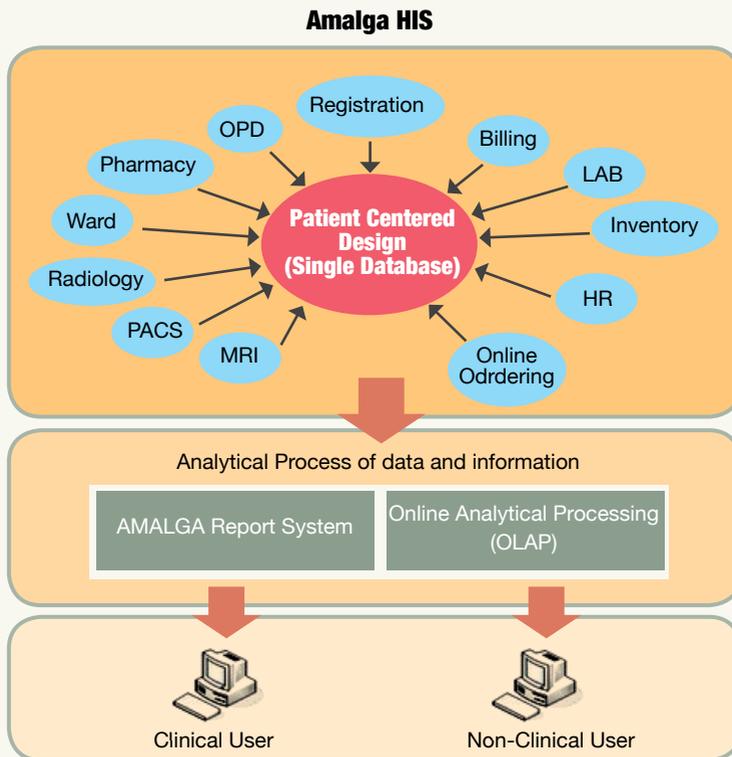
**Bumrungrad** means “care for the people”. Bumrungrad International Hospital (**BI**) has an organizational culture which is built upon a focus of excellence, quality and compassionate care for all patients with equity. Currently **BI** is a popular medical hub in Southeast Asia where over 1.2 million patients a year from over 190 countries are treated per year with a world class quality standard of care.

**BI** was the first Asian hospital accredited by the US based Joint Commission International (JCI) in 2002, was reaccredited in 2005 and now in 2008. **BI** won several awards including the AMDIS (Association of Medical Directors of Information Systems) award, which recognizes excellence and outstanding achievement in applied medical informatics. It was the only hospital outside the US to receive the award in this year. Furthermore **BI** also received the “Best Wireless Project Southeast Asia” award from Motorola’s Enterprise Mobility Business in 2008.

### ICT @ Bumrungrad

**AMDIS** awards honor individuals and organizations who have successfully applied information systems and computer technology into their practice of medicine.





In 2007 **BI** partnered with Microsoft to install a state-of-the art, fully integrated, single solution hospital information system which improves patient care by giving clinicians quick and complete access to information within and across different departments. The system, **Amalga HIS**, was originally developed in Thailand and is now recognized worldwide for providing access to hospitals across international markets. BI is not only a user, but also is a strategic partner to help continue developing and improving the system in order to providing the best of care for patients through information technology

Microsoft Amalga HIS maintains a single database for all BI patients. Users can search key data including registration, clinical systems, patient bed management, patient diagnosis, laboratory data, radiology reports, patient demographics, etc. It also supports all hospital business transactions including appointments, scheduling, billing, ordering, etc. The built in paperless medical record greatly increases the speed of patient accessibility and is available online throughout the hospital for authorized personnel.

**BI** has introduced Wi-Fi, providing 300 access points to give patients and guests with capable devices internet access from anywhere in the hospital. Wi-Fi users can connect in minutes, the same way they do in most Wi-Fi locations around the world. The network is one of our many investments in technology to help serve

our 1.2 million patients each year. The wireless network serves not only patients and visitors, but also doctors and staff. Patients can even rent laptop computers to stay in touch with friends and caregivers back home.



### Pharmacy Robot improves patients care and safety

BI is the first and only hospital in Asia to use Swiss log, a robotic pharmacy system, to supply unit-dose medication for its inpatients. The technology reduces medication errors by lowering complexity, avoiding over reliance on memory, simplifying key process, and increasing efficiency.





## Bangkok Hospital

**Bangkok** is the largest health-care service provider and operator in the country and ranks amongst the top elite group in Southeast Asia with a medical facility developed exclusively for international patients. **The Hospital** has been designed to address all cultural and linguistic considerations while providing the full range of amenities expected of a world class multicultural institution.

Bangkok Hospital, Bangkok was the first private hospital in Thailand to receive the ISO 9002 & 9001:2000 accreditation and took 1<sup>st</sup> place at the Hospital Management Asia Awards for their Integration of Quality Improvement projects by using the Standard Requirements of Hospital Accreditation and Brand Management in 2002, and won several awards including being accredited by the Joint Commission International (JCI) in 2007

## Networking

Today, Bangkok Hospital Group is the kingdom's largest hospital operator with a network of 13 hospitals covering many provinces in Thailand and even Cambodia. Bangkok Hospital has grown to become the leading hospital within the network in Thailand. The hospital developed its facilities, technology, service standards and personnel to become one of the most respected and renowned medical leaders in Thailand and the broader Asian region.

**The Hospitals** patient services include, among others; Translation coordination, immigration, travel and accommodation assistance - in addition to dedicated reception and community lounge areas, menus catering to dietary requirements, and the needs of patients from different faiths and traditions.

## Enable remote diagnosis

**Bangkok Hospital, Bangkok** is a leader in specialist health care which upholds the values and ethics of medicine and its treatment; utilizing advanced equipment and technology. Other hospitals, in the Bangkok Hospital Group can connect via its data network to **the Hospital** via tele-consultation services, providing more efficient

treatment, helping patients save time and travelling costs when consulting specialists in Bangkok while they continue visiting their own local doctors.

**Tele-consultation** is a telephone consultation service used between physicians at our different network hospitals allowing for long distance diagnosis and consultation, while also allowing follow up of high-risk patients in the comfort of their own homes. This tool is particularly useful for a hospital where doctors representing different specialties often consult one another on complicated cases. The system even allows physicians to share and review x- ray films from the Picture Archiving and Communication Systems (PACS) which provides the best in digital imaging.

PACS is a system that enables images such as x-rays and scans to be stored electronically. The application can be used for consultations, treatment planning, diagnostics and reporting sessions, allowing the physicians to interact and work more efficiently on cases - wherever they are, they can talk to specialists at any other location in the hospital network.

## Language no barrier to care

IT allows non-Thai patients to be treated in their own language - **Bangkok Hospital, Bangkok** has utilized IT to bridge 26 languages and cultural barriers.

The hospital has applied the Unified Communication Technology to drive a patient-centric approach; enabling doctors and interpreters to communicate on computer monitors through the Cisco VT Advantage camera operating on Cisco SoftPhones.



## Conclusion

Information and Communication Technologies (ICT) used in Bumrungrad International and Bangkok Hospital have the potential to improve all aspects of our social, economic and cultural life. ICT is one of the key effects in the health care system that enables us to support the changing behaviors of our patients, who are also becoming increasingly Internet-savvy and in many cases have attained a profound understanding of their medical complaints and diagnoses, compared to the past. ICT improves patients care and safety, helps to save and sustain life, even at critical moments, and improves the quality of interventions and the health care system by allowing patients to readily interact with health care experts without having to leave their homes

## Acknowledgement

Special thanks to BI and BMC 's informants including Dr. Chamaree Chuapetcharasopon (Medical Director), Dr.Chatree Duangnet (CEO Bangkok Hospital Medical Center) Kaorop Wongprasert (Communications,Senior Manager), Monthon Woranart (Department Manager) Pankit Siripool, MD ( IT Advisor) Pongtep Gongsakdi (Assistant Director) Also,greatly thanks others that helped with this manuscript.

## Anywhere and Anytime: An Effective ICT to Support Primary Care Health Workers





## Anywhere and Anytime: An Effective ICT to Support Primary Care Health Workers

Laiad Jamjan  
Kattika Thanakwang

Primary care is the lowest level of health service hierarchy. Managing information at this level does not affect only its own services provided for people in their catchment area but also makes an impact to all managerial levels above it. Most of health data collection especially for facility-based information are produced at primary care level and then pooled at district, provincial and national level. Provincial level is recognized as the most important level in terms of supporting information development, maintenance, management and utilization of health data collected from all health facilities in a province. Ang Thong is an example of provincial self development of HIS at primary care level both for services within and outside facilities and also for managerial purpose at higher level. ICT application and tool was developed and practically implemented including an innovative data collection tool via hand-held computer at communities.

### Ang Thong at a Glance

Ang Thong province is located north to Bangkok, having an area of 968 square kilometers, is only 108 kilometers along the Asian Highway from Bangkok. It is administratively divided into seven Amphoes: MuangAngThong, Chaiyo, Pa Mok, Pho Thong, Sawaengha, Wiset Chai Chan and Samko.

Flourishing on the banks of Noi and Chao Phraya Rivers, Ang Thong Province is a small province in central Thailand. This region is famous for its various ancient and beautiful temples symbolizing the Thai history. Better described as a land of temples, Ang Thong region has several marvelous shrines known for their intricate mural paintings and wooden carvings. Wat Siroi is located on the bank of Noi River and has a large seated Buddha image. Wat Chaiyo Worawihan is a royal Buddhist monastery located on the banks of Chao Phraya River.

There are several temples that have been built during the ancient Ayutthaya period. Popular among these include Wat Phohom, Wat Saket, Wat Mathurotsatiyaram, Wat Ratchapaksi and Wat Khun Inthapramun. The largest and longest reclining Buddha in Thailand is enshrined here. Wat Chantharam is famous temple among the visitors for the large population of bats, which are found hanging upside down from the branches of the numerous trees present around the temple.

Ang Thong is well known for its handicrafts. People of this region exhibit exquisite craftsmanship in making bamboo baskets, molded court dolls, traditional drums and prefabricated parts for Thai-style house. Ang Thong is famous for the traditional long boat race held during March and





October. There are few other prominent annual festivals celebrated in this region including City of Rice and Water Bowl Fair and Annual Red Cross Fair that is held at the end of harvest time during December-January.

### Primary Health Care in Ang Thong

Ang Thong province has a long history of primary health care (PHC) development which started regarding to the National PHC program that was implemented nation-wide as part of the Fourth National Health Development Plan (1977-1981).

In the modernization and globalization era, using appropriate technologies in primary health care is necessary and needed to develop fitted with any contexts. Fortunately, there is initially established a new innovation of Information and Communication Technology (ICT) system at Ang Thong to support health workers for integrating both data system management and health services.

### Using ICT in Primary Care Units

Various information technologies have been used in Ang Thong healthcare system. For the earlier time, there were several programs or electronic systems, such as BASICPRO, THO, HCIS, Family Folders, EPIDEM, PHIS.net, and E-Healthy Thailand, which have been promoted for health personnel in primary care units. These programs have been used for data gathering and reporting to Ang Thong Provincial Health Office.

Regarding the numerous programs mentioned above, if we are health workers, we may be either stressed or confused to carry out. Don't forget, the main tasks in primary care unit are not working for documentations but providing health services for people in the community.

It is not surprisingly that many problems occur because of the excessive information technologies. Some programs are redundant or overlap, complicated, and inconsistent with the need of health workers. Data are limited for transferring and connecting to other networks. Importantly, some contents of data gathered are unable

to support the quality improvement of services at primary health care. Therefore, using appropriated technology in order to integrate both data served for provision of local health services and data reported to related agencies is needed and is a challenging task.

### E-Care-1: The Effective ICT for Primary Health Care

To overcome the problems that ICT system is fragmented, Dr. Suwanchai Wattanayingchareon, the Ang Thong Provincial Chief Medical Officer, and his colleagues had developed the integrated ICT, called "E-Care-1". They created a tailor made the ICT system which fits for health workers and integrated to both provincial and national health systems. The meaning of "E-Care-1" is shown as follows:

"E" means electronic that refers to the management of electronic data through computer, web-based application, and networks.

"Care" means caring that includes treatments, health promotion, health prevention, and rehabilitation for all age groups.

"1" means primary level that refers to healthcare system served for people in the community.

Thus, "E-Care-1" is the new informational technology system, which has been designed for using at primary health care and has been developed consistently with the community context.

E-care-1 has been developed through many steps as follows;

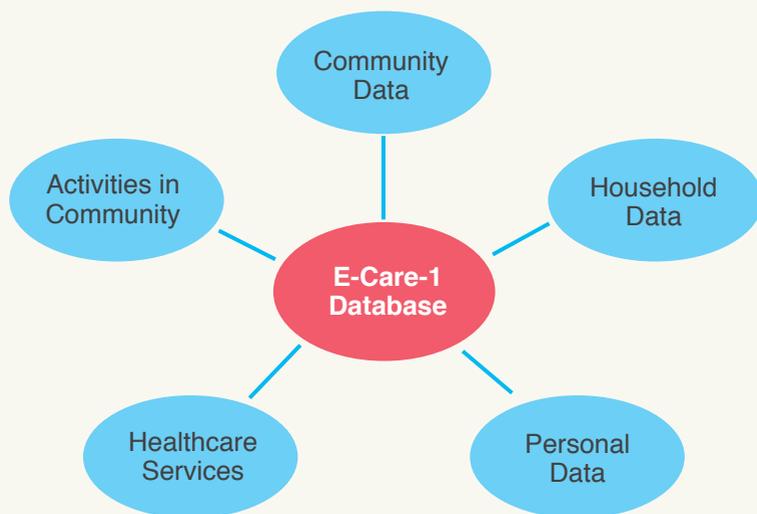
1. Gather the need of health workers and requirement of healthcare system.





2. Analyze the whole system obtained from step 1 and design the new informational technology system.
3. Develop the informational technology system designed in step 2.
4. Test the new information and communication technology system to look for the error of program both unit testing and system testing.
5. Install and maintain the information and communication technologies at both Ang Thong Provincial Health Office and Primary Care Units, including train the users.

E-Care-1 is an effective ICT for primary health care. It is developed based on the problem-based solving, the need of health workers, and the integration of data management. E-Care-1 is designed with object oriented using UML (Unified Modeling Language) and UP (Unified Process) as an instrument. JSP and Java are the main languages. It can be connected and transferred the data from the old information technology system. Therefore, it is modern, integrated, flexible, safety, and expandable.



E-Care-1 can collect vast of data. Its database includes the 5 main data sets that are related to each other as shown in the diagram below. Personal data includes socio-demographic data and health behaviors. Household data includes household characteristics and sanitation. Community data includes facilities and organizations within community. Healthcare services data includes services for general diseases, specific chronic diseases, laboratory services, past history, diagnosis and laboratory results. Activities in community include any activities undertaken within community for health promotion.

### Personal Digital Assistant (PDA): An Innovative Pocket PC Mobile of E-Care-1

PDA is a mobile device, also known as a pocket PC that is applied for providing home health care. A pocket PC is a small mobile computer, facilitating for the convenience to record and collect the data. It provides various innovative applications of information technology for primary health care.

The data can be transferred from the main compatible PC to PDA. To use this mobile device for home visit, Bluetooth technology is used for data transfer, and PDA can synchronize the data with the PC. This allows up-to-date contact information stored on software and to update the database on the PDA. The synchronizing system is advantageous allowing users to access the same information on the PDA as the host computer.

As primary health care has focused on community care and health promotion, home health care is considered as one of the proactive strategies. However, for the previous time, there were many





obstacles for home visit; for example, health workers had to take numerous documents, folders, and manual records. This is affecting data management, time spent for caring, quality of care, and satisfaction of clients. To date, PDA is the informational technology used to deal with these limitations. It is small but excellent.

### Anywhere and Anytime for Utilization

The E-Care-1 system is easily to use, in which health workers can utilize it anywhere and anytime. This is because it can be used not only at primary care unit, but also in the community through a pocket PC, an innovator of easy-to-use mobile.

Despite some limitations, E-Care-1 is more beneficial for all related. Its advantages provide for health workers, primary care units, and the whole ICT system, including the people who utilize health services.

Target people in all age groups, in particular, maternal and child, chronically ill persons, or elderly people can conveniently access healthcare services, leading to equity and equality of healthcare utilization. Moreover, the quality of services is improved that makes the people satisfy, simultaneously

Health workers and primary care units can get benefits from this system as follows:

- Databases are completed, accurate, and up date, which facilitate to improve the quality of works.
- Increase a systematic management of data using, referring, and reporting.
- Reduce unnecessary or redundant steps of works.
- Save cost of services (e.g. reduce paper using, manpower using, and time spent).
- Improve communication and coordination both within organization and inter-organization.
- Facilitate learning process and knowledge management.
- Enhance an image and trustworthiness of organization.

Lastly, related ICT systems of PHCs of Ang Thong province are interconnected as a network, which the hub is located at Ang Thong Provincial Health Office. Thus, the data are available and easy to access. As one nurse in Phomuangphan primary care unit said,

*“After E-Care-1 system was introduced, it helps me very much to manage the data both data gathering at PCU and data reporting to Ang Thong Provincial Health Office. I am satisfied this new system, in particular the pocket PC, it is very convenient that I don’t need to carry many documents and folders of patient for home health care because all data I need are here”*

ICT network of E-Care-1 is based in Ang Thong province and offers high quality information technology support services to institutional care, home health care, and community care. The process involves greater use of technology to improve treatments, health promotion, and data transfer. This technology allows health workers to make a greater contribution to service management. It is undoubtedly that E-Care-1 is an effective innovation for PHC in Ang Thong. Not only do health workers can conveniently use this electronic system in anywhere and anytime, but it also provides the advantages to Ang Thong people who are the definitively target group in PHC.

E-Care-1 innovation becomes more integrated in all aspects of healthcare data. It makes the seamless services for primary health care.



### Acknowledgement

We would like to thank for the information and kindness given from Dr. Sajoi Marumdee, of Ang Thong Provincial Health Office, Mr. Prasart Limdal and Ms. Wanna Prapapoch and all healthcare workers in Phomuangphan primary care unit

## Learning Networks to Strengthen the Provincial Health Information System





## Learning Networks to Strengthen the Provincial Health Information System

Kamolrat Turner  
Patcharapa Kanchanaudom

Provincial level acts as the key point of connection between health care facilities and central management level. Provincial public health offices have opportunities to develop local system for strengthening their working process and improving their outputs. Health information system at provincial level needs collaboration and connection through network of health facilities in each particular area. One important strategy is establishing data centers for pooling data from health facilities and serving use for all levels. Ratchaburi gain experiences in supporting data center as one of the learning networks model. District and provincial data center facilitate better care for people including continuity of care as well as accessibility from local and central level. ICT and MIS are also used to improve smooth services at health facilities and planning processes at district and provincial level.

### Ratchaburi at a Glance

Ratchaburi is one of the provinces in the central region of Thailand. Neighboring provinces are (from north clockwise) Kanchanaburi, Nakhon Pathom, Samut Sakhon, Samut Songkhram and Phetchaburi. In the west it borders Tanintharyi Division of Myanmar. Ratchaburi covers 5200 square kilometers. It is located 80 kilometers west of Bangkok and borders Myanmar to the west with the Tanaosi range as a borderline. The Mea Klong River passes through the center of the town. The province is subdivided into 10 district. The district are further subdivided into 104 subdistrict and 975 villages. Ratchaburi means, "The Land of the King." The province is replete with cultural heritage, beautiful places, and historical sites.

### Demands and Endeavors

The complexity of health problems and health care delivery systems of today's world has created the demand for an efficient data management system. In the past, health data were recorded and reported to the central center monthly or every trimester. Initially, data reporting was done by writing information onto paper based forms designed according to the need of the Ministry of Public Health (MOPH). This procedure caused delays in the transmission of information as it would be sent from local health settings to the district health office, provincial health office, and the MOPH respectively. An advanced information technology was therefore needed for acquiring accurate and updated health data.

Moreover, with the old practice of data collection and reporting, health personnel spent a significant amount of time doing documentation (70 to 80%)





and had very little time left for actual health services. This has also mandated the development of a better health information system that can effectively deal with the huge amount of complex data.

The MOPH has attempted to establish a system that can support substantial information and yield specific and significant data that can be used as input for the development of health plans, policies, and strategies at various levels including district, provinces and the nation. A health information system was then developed encompassing 2 minimum datasets. However, setting up a data center at all district and provincial levels across the country proved to be too challenging. Moreover, it was found that the two minimum datasets were inadequate for decision making and further management. The National Health Security Office (NHSO) has therefore introduced a pilot project for the development of system models in eight selected provinces.

### Ratchaburi Public Health Care Settings

Ratchaburi province, one of the selected provinces, is administratively divided into 10 district and has 12 public hospitals including one hospital under the Ministry of Defence and 11 hospitals under the Ministry of Public Health, which are categorized into one regional hospital, three general hospitals, six community hospitals and one health promotion hospital. At a lower level, there are 171 health centers/primary care units. Ratchaburi province, with its long demonstration of outstanding work in many aspects of health services, has been selected to participate in the pilot project and proved its fame with another exceptional piece of work. In addition, Ratchaburi is a pioneer province, where people can use smart cards and house registration certificates for verifying and confirming their rights to receive all types of health care at any primary care unit throughout the province. Thus, it requires systems and processes designed for collecting day-to-day data and exporting them to the central center.

### From Primitive to Innovative System

The health information system of the Ratchaburi networks has developed step by step through the learning-by-doing process with several experiments from a purely primitive method of manual or paper-based documentation to an information technology system. Getting away from the chaos of enormous paper-based forms, Microsoft word and excel were initially used to record health information. However, with these basic computer programs, data management was not easily performed. Subsequently, a webpage program using hypertext markup language (HTML) was brought to develop an early health database. Afterwards, a personal home page (PHP) and contents management system have been adopted to improve the system so that the data in the database can be easily used and reused as needed. With this innovation, various data processes can be performed either via the intranet or internet through the network system. In addition, the current system is eligible for further development or improvement.

### Achievement through Learning Networks

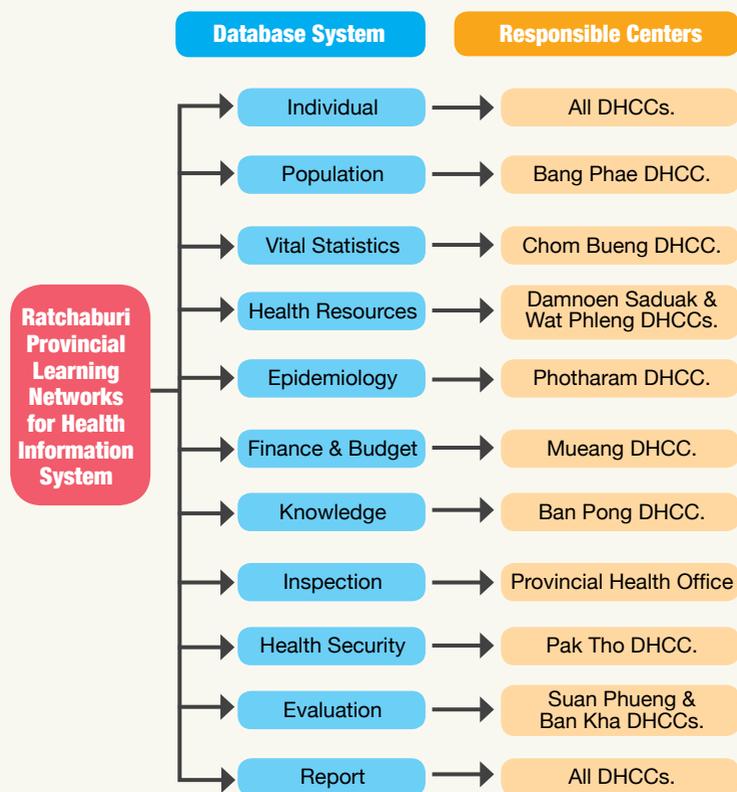
The Ratchaburi Provincial Health Office has a unique experience in implementing the health information system using learning networks. With an initiative to establish a health information system that can link and share data from all administrative units and health facilities at different levels within the province, a web-based database has been developed and tested. However, an inadequacy of skilled staff caused difficulties in implementing the whole complex system throughout the 10 district of the province. A meeting involving all district health administrators was, therefore, organized to develop a solution for setting up the





information and technology learning centers at assigned district including the Provincial Health Office.

Each learning center is responsible for one database of the system and acts as a learning center for the responsible area. All learning centers support each other in building the capacity of health staff in



implementing and using the provincial health information system to improve their work. Every learning center developed its own database management system. Great support from administrators at all levels, good teamwork, skill and commitment of all involved staff, contributed to the success of the learning network.

### The Bangphae Data Center as a Leading Model

An information center of the Bangphae District Health Coordinating Committee (DHCC), the leading center for the Ratchaburi learning networks, has yielded distinctive development of the health database system that can function as a model for other centers. Commencing in 2006, with collaboration and participation of administrators and a working team, the Bangphae center has established effective and efficient database models, after several trials and improvements in response to the advice and comments of experts from the Bureau of Health Policy and Strategy. The population database system has been well developed so that it can cover and provide updated data. A back-up system has also been created for emergency use. The models have been shared and used within the district and province. In 2007 the DHCC won an award of excellence for their innovative development of a health information system model. Since 2008, Bangphae DHCC became a learning center for health information system development, sharing innovation and facilitating other DHCCs in implementing health databases. With continual development, in 2009 Bangphae DHCC received another award of excellence for their population database information system regarding the management of data, database system, and personnel.





### From Local to Central Networks: Connectivity has no Limitation

Though IT resources are limited, local administrative units can easily access the database system. All PCUs or health centers in Ratchaburi enter and report health data daily so that the central organization can view and make use of accurate and updated data.

### Advantages of the Innovation

The implementation of an innovative health database system has brought many advantages to all involved, including patients, care providers, and administrators. Some of the advantages are exemplified below:

**Smooth Services with Smart Card:** The use of smart cards (electronic personal identity card with 13 digits) was also added to the developed system in order to facilitate universal health coverage and support the flow of daily health services. It was found that the use of the web service and the ID card enhances smooth and rapid flow of services within the hospital, commencing from the first step of presenting the ID card to the last step of receiving medications. In the past, the clients needed to carry a hospital card and a health insurance card to show at the reception and then waited for his/her OPD (Out Patient Department) card or folder to come out. Checking for health insurance was another step to go through. After seeing the doctor, there would be many more steps for the client to go through to obtain their medication. The currently developed system, with information that is online and linked to all units, significantly reduces service time. Having the ID card or the 13 digits, people can go to any PCU and there is no need to carry so many cards.

**Provision of continuing care throughout the province:** As health information can be viewed and used across the province, the patient can receive continuing care and treatment at any health care setting within the province.

**MIS:** The data can be used for management information system (MIS) relating to the administration of health service and budget. For example, daily reporting of the number of patients can inform prevalence and epidemiology of certain diseases in certain areas. The data can also be used to predict health situations and trends.

### Conclusion

Ratchaburi Provincial Health Office has been participated in the pilot project to implement a health information system and developed a model that can be extended to other provinces. Learning networks have been formed within the province to strengthen all information centers and to date many databases have been well developed and effectively used.

### Acknowledgment

Special thanks to Mr. Wasan Saithong, a Plan and Policy Analyst, Senior Professional Level Chief, Information and Communication Technology Center who provided educational information.



Achieving Universal Health  
Coverage through Effective ICT:  
The Role of National Health  
Security Office





## Achieving Universal Health Coverage through Effective ICT: The Role of National Health Security Office

Vipavee Thongpriwan

There are various demands on strengthening health information system in the era of achieving universal coverage of health insurance. Many databases were designed and retrieved by the National Health Security Office including Beneficiary database Hospital database, Medical Records database, Reimbursement databases, e-Budget database, Financial and Accounting databases etc. A positive impact of linking payment mechanism to the requirement of service data is a rapid increase in coverage of health service data from contracted health providers both public and private. Financial incentive is recognized as a key driver for gathering higher coverage of data with better data quality through data verification method. Essential health services data retrieved from all health care providers in universal coverage system can be used for assessing health system performance and improving health care quality.

Prior to 2002, it is common for Thai people who can afford health insurance to have not only one but multiple providers. For tens of millions Thais who cannot afford the health insurance, they are forced to live their daily lives hoping that nothing catastrophic will happen to themselves and their family.

There are several factors that have been hypothesized that have hindered the development of an universal healthcare system in Thailand including the lack of Personal Identification Numbers (PID) of Thai people database, the dynamic personal data (e.g., birth, death, job status, etc) affecting the eligibility of healthcare coverage, and inefficiency of healthcare coverage database and data communication among existing benefit schemes.

### Milestone of National Health Security Office

In response to the lack of healthcare coverage in our country, Thailand, in 2002, launched the policy of universal healthcare coverage and the National Health Security Act, B.E. 2545. This Act helped to officially establish the National Health Security Office (NHSO), which is an autonomous state organization that is commissioned to ensure that all Thai people be entitled to healthcare services that meet a minimum standard and efficiency.

The main responsibility of the NHSO is to ensure proper and efficient management and distribution of the health security fund to subsidiary health facilities, which provides services of health promotion, disease prevention, curative care, and rehabilitation of the approximately 47.5 million uninsured Thai citizens.



Up: NHSO Service Center,  
Bangkok, Thailand  
Down: NHSO Issued  
Beneficiary Gold Card



The NHSO is also responsible for ensuring that all participating health care facilities meet the minimum required standards of healthcare delivery for their care recipients.

### Using ICT for Quality of Health Care for All

Thailand's dreams of universal healthcare coverage wouldn't be successful without the positive attitudes of the participating parties, proper financial support and planning, and also the rapid development of Information and Communication Technology (ICT). NHSO realized the importance of an effective ICT system from its infancy and utilizes their ICT to handle millions of health transactions a year. At the core of NHSO is its data center, which is integral to all their operations as shown in diagram 1.



**Diagram 1: Illustrating the linkage between NHSO's data center and its 6 core responsibilities.**

Although NHSO began with a rather minimal database and IT infrastructure, it has now developed a complex system of multiple databases that manages hundreds of thousands of transactions on a daily basis. The daily activities may include a combination of medical services (e.g., Beneficiary database, Hospital Database, Medical Records Database, Reimbursement Databases, e-Budget (Fund Administration) Database, and Financial and Accounting Databases) transactions.

One important database of the ICT system is for the registered healthcare facilities which contain more than 11,400 units that are classified as primary medical, secondary medical and tertiary medical units. All eligible Thais who enroll into the Universal Coverage Scheme (UC) will be added to the beneficiary database of the ICT system. This beneficiary database will be linked with the hospital profiles and medical record databases.

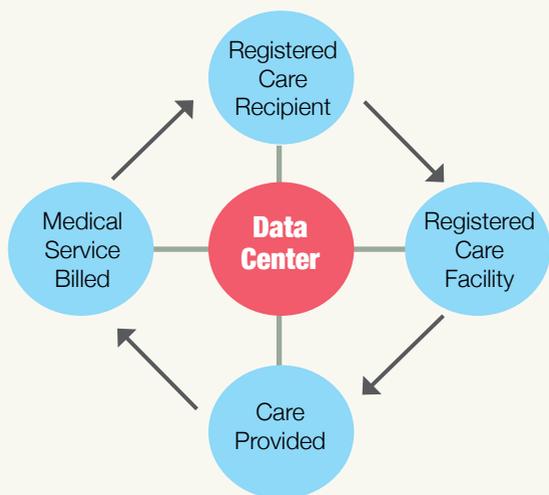
In addition, the ICT system is able to examine beneficiary duplications among three existing health coverage databases [e.g., Social Security Scheme (SSS) for formal sector employees; Civil Servant Medical Benefit Scheme (CSMBS) for government employees; and the UC]. Diagram 2 illustrate a scenario where upon a patient enters a registered facility to receive care and how the assortment of databases operate and interact.

### Fund Management

The ICT system links the hospital facility database with the beneficiary database to calculate a facility population total, which is used to determine a base amount funds needed for the site, called e-budget. And when a patient in the beneficiary



*Example of Primary Care Unit Covered under NHSO Gold Care*



**Diagram 2: Illustrating the interaction of various databases during a routine medical visit.**

database visits the facility with a medical condition, the hospital is reimbursed on a case by case basis via the reimbursement and medical record databases (e-claim).

### Call Center

A 24-hour call center is available for both registered health facilities and for registered and potential care recipients. The call center serves two primary purposes: a) provide health coverage and policy information for beneficiary and facilities, respectively; b) provide a medium for patient complaint.

The call center is a way for NHSO to ensure that care recipients receives proper care for their medical condition. Although the call center provides a safe haven for care recipients to voice their displeasure with care received, the center's data indicates that less than 3% of the total calls have been to report a complaint. A great

majority of the center's incoming calls are requested for more information including questions about whether their health condition is covered under the UC plan and whether a particular hospital is a registered UC facility.

### Health Service Quality Control

A positive byproduct of the centralized UC systems is that it facilitates a convenient way to perform system assessment and ensure quality control. Since the ICT system captures all essential data from all parties, it allows NHSO to oversee the entire operation for not only strategic planning purposes but also for screening potential abusers of the UC system.

### Future plans

Although the ICT system has improved immensely over the past eight years, there is always room for improvement with regards to data collection, linkage and information dissemination. Furthermore, the usage of the collected health data information to inform future strategic planning and development has yet to be utilized to its full potential. The warehoused data will have to be analyzed, interpreted and disseminated to ensure continual improvement of the UC system.

### Summary

The NHSO was established in 2002 to provide a basic essential health care coverage for the underserved Thai population who wouldn't have been able to afford health services otherwise. Since its inception, the foundation of the UC system is the development of the ICT system. The ICT system is integral to every single aspect of UC daily operation and without such an



*NHSO Call Center Services*

integrated system; it is unimaginable to think about how a successful universal health program can be achieved.

### Acknowledgement

I would like to thank Dr. Yolsil Suchonwanich for sharing his insight on daily working of the ICT system and Ms. Pornpimol Senphadung for all her hard work in organizing all the activities.

How to implement an online  
civil registration system  
that makes a timely vital statistics





## How to implement an online civil registration system that makes a timely vital statistics

Sukjai Charoensuk  
Laiad Jamjan

Civil registration is one important component of population-based health information system. Gathering vital event data is a basic requirement for health managers at both national and local level to monitor a changing pattern of population and also burden of mortality. The Ministry of Interior has developed electronic databases on birth and death and collaborated with the Ministry of Public Health in managing and using this data as a data sources for measuring distribution and trend of birth and death. An electronic-based online system has been implemented to improve timeliness and completeness of data collection and data flow to central level. However, the development of civil registration is a never-ending story. The new era will be the development of smart card for all citizens which allow people to access to their own data.

### Smart Card Smooth Life

With the development of advance technology, Thai people will be soon able to access their own personal data and manage the data at a single stop using a smart card. Smart card is an identification card issued by the Bureau of Registration Administration since 2003. Beside the primarily used for identifying a person and record personal information on the chip, the smart card also increases the convenience for Thai people in their life. These include using the card for government e-services, such as requesting a copy of a house registration or an ID card, and also checking for the services added include showing the right to vote, information about social welfare and public health insurance, etc. The success of smart ID card makes the civil registration system more effective in making a timely availability vital statistics, especially birth and death registrations. The Bureau of Health Policy and Strategy is responsible to process these vital statistics for making health policy and plans in order to maximize Thais' quality of life. It has been a long road for the revolution of the registration and ID card to bring Thailand into the digital world.



### The Beginning of Civil Registration

Population surveying has evolved since the era of King Rama V, and the first People Registration Law was endorsed in 1956, which did not call for grievous punishment though non-compliance citizens would lose their rights upon avoiding the law. At the beginning, the task was done by hand, and all documents were hand-written. The registration and ID card development utilizing information technology, commenced on July 20, 1982. The Cabinet, under the government of General Prem Tinnasulanonda, approved the



ID card project proposed by the Registration Division of the Local Administration Department under the Ministry of Interior (MOI). “If we want to give a credit to someone for the development, it has to go to Surachai Srisaracam” said by Vichian Chidchanognarth, the director of Administration and Development Technology for Registration Division, Bureau of Registration Administration. “Surachai Srisaracam” was a former director of Bureau of Registration Administration. He used to work as a deputy sheriff, and he was faced with many problems related to the registration system, such as document being lost, mistake occurring during document recording. Also, there was no data available for decision-making, and public agencies could not share data with each other. These problems, together with a step forward into digital society, drove him to apply IT to manage his data. When he studied for a master’s degree in the United States, he did a thesis on “Registration System Development”, which he intent to serve as the base for his future work.

### The Evolution of house registration and ID card



The Registration Division leading by Surachai Srisaracam operated a plan which focused on four critical factors for the project completion: people, place, equipments, and data. People were recruited including 90 deputy sheriffs to attend computer training classes, and 1,000 temporary employees to carry out data entry. The place was set at Chaiya Palace, which became a computer center. As a key equipment, a computer system was implemented which included a mainframe computer, 400 terminals, data management, and the blueprint and computer program development. In term of data, the registration office nationwide transformed the old house registration document into a new format, adding two additional columns for the census code and the 13-digit ID number.

The data duplication into the new house registration document was the beginning of house registration and ID card evolution of Thailand. The 13-digit number was meaningfully initiated based on their application, and could be utilized for the next 250 years. The ID card project was carried out for providing people identification number and having the number to use for data management in the computer system. After the new version of the house registration document was designed, the Registration Division distributed them to Amphurs so that data from the old document could be transferred to the new documents. It took a year for 800-plus Amphurs nationwide to complete the task. Staffs on the data collection teams went upcountry, province by province, to copy every single new house registration and carry all information back to the Central Registration Office in Bangkok. The temporary staffs, meanwhile, keyed the information regarding the road, village, and nationality into the computer system. This was the beginning of the computerization effort. Once the citizen database was verified, the Registration





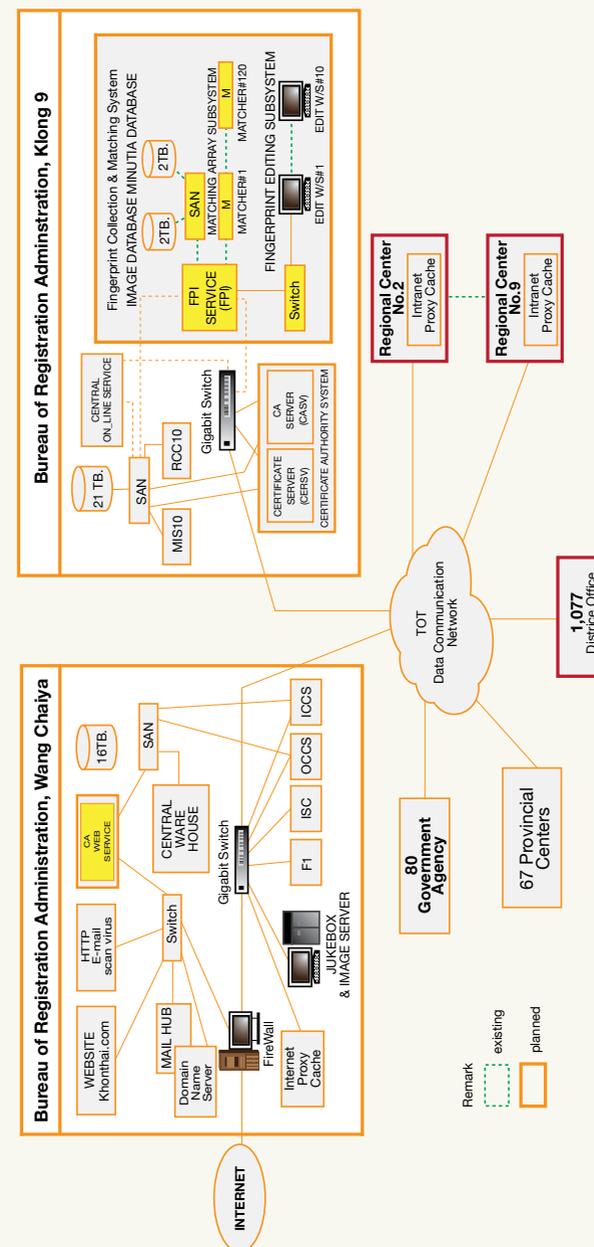
Processing Center printed out house registration, which then delivered to Amphurs throughout the country. At the same time, the ID card was issued in colors, instead of an old black & white style if the person was validated to ensure that the name and address matched with the central database.

Thailand, at that time (1986-1987), was one of the first countries with a computerized database of its population. Thailand won **the Computer World Smithsonian Award** in 1990 for the use of computers in the public sector field, defeating 45 nominated countries, and was the first project outside the USA to receive this award. Awards for the Center were not limited to that. It was also awarded recognition by the National IT Committee, for a government project in 1999, and was awarded **the Merit award for Best of e-Government & Service Asia Pacific ICT Awards** in 2001.

### Benefits for People and Public

The database has been developed endlessly, and can be used for a great many applications. In daily life, the house registration with the ID card is a requirement when dealing with official matters. To apply for a driver's license, social security, tax holder number, bank account, and so on, all required the house registration document in order to identify the person making the application. The database can print out house registration information accurately and identify a person showing a real number of population. The system, moreover, keeps data on facial features and fingerprints. The concept of One Stop Service was initiated to bring more convenience and faster service for people.

Each related agency needed to be computerized and shared their database, especially the registration administration then the nationwide online registration and ID card system was accomplished in 2003 under the smart card project. Database systems that related to public services were linked together in order to pave the way for the national policy of One Stop Service. Based on the Cabinet approval, various government agencies will share their information on a single card, such as information from the Ministry of Public Health (MOPH), Ministry of Social Development and Human Security, Ministry of Labour and Ministry of Agriculture and Cooperatives. These are the benefits in terms of policy and many





organizations can use the data for statistics in strategic planning. Overall, One Stop Service is a policy that benefits all the citizens of Thailand. It improves the quality of life and society. It offers an equal chance for people nationwide to access government services. Most of all, the people will receive faster service with easier access, and greater convenience.

### Vital Statistics: A Source of Health Policy and Strategic Planning

The Bureau of Policy and Strategy (BPS) is the agency under jurisdiction of Office of the Permanent Secretary, the Ministry of Public Health where is responsible for the management of health planning and strategies. The BPS is 1 of 93 agencies, which currently shares information online with the Registration Office. Every individual birth and death records from the vital registration is transferred to the BPS on a monthly basis. At the BPS the records are coded, using International Classification of Disease version 10 coding system (ICD-10). The coded data are analyzed and reported for health planning and policy making at both ministry and provincial level. With this close collaboration between MOI and MOPH, the information about number and health status of population at national and provincial level are timely available to use by any agencies who need them.

Although, the records of birth and death are accurately collected with this collaborative system, Thailand is still challenged with the quality of cause of death information. The accuracy of the cause of death is compromised, because 60-70% of the deaths occurred outside hospitals and be classified as natural cause of death by civil registration officers who are not health professionals. BPS has been working on these challenges in many ways. Tool that help health professionals diagnose cause of death such as verbal autopsy is being implemented in many provinces. The manual of medical certificate of cause of death based on ICD-10, tool that educate health professional, has been distributed to hospitals and health centers nationwide to explain how to report causes of death.

According to the Health Metrics Network (HMN), health data sources are categorized into population-based and institution-based information. Population based data sources includes census, civil registration and population surveys, whereas institution-based data sources refer to individual, service and resource records. The virtue of health information is to help decision making process of all related sectors and at all level of services from the point of care to policy makers in the national level. Therefore health information systems should be integrated. With integrated health information systems, the endeavor of creating effective health system can be achieved.

Although the integrated health information systems could ensure high performance health system, it is not easy to develop. The development of effective health information systems not only needs development of applications and services but also the development of the foundations, for instance health information standards, health information governance. Dr. Boonchai Kijsanayotin, the key man at the BPS, mentioned a big step that need to be concerned to improve health information system in Thailand: "There is a pitfall when thinking that just using ICT health data and information will be perfect... technology cannot solve the problem if we don't working on foundations of health information... such as setting standards for data safety, data management, standard vocabularies, and so on... the programs that we are developing nowadays look like we put something on the top without the base...health information is complex because of the uncertainty of clinical events .....we need more resources and efforts to support the development of our national health information systems." He said.



The Computer world Smithsonian Award



Changes in IT Systems  
in Response to Healthcare  
Strategic Demands:  
Lessons Learned from  
Siriraj Hospital





## Changes in IT Systems in Response to Healthcare Strategic Demands: Lessons Learned from Siriraj Hospital

Panarut Wisawatapnimit

University hospital is on the top of health service hierarchy. Highly advanced health information system is possible to be adopted at this level. The appropriate HIS and ICT will serve mainly clinical services including highly detailed clinical data, laboratory and imaging data as well as data on treatment and patient condition staying in hospital. Connectivity within hospital becomes more complex and requires more ICT resources. Siriraj hospital, one of the biggest hospitals throughout the country, has implemented IT system both front office and back office. The front office system serves comprehensive patient care including imaging and laboratory data and applies HL7 standard for interfacing healthcare information. Back office system serves decision making and managerial purposes. All IT systems are connected and continuously developed toward International Excellence Centers in Medical.

Faculty of Medicine Siriraj Hospital, Mahidol University, is located at 2 Prannok Road, Siriraj, Bangkok Noi district, Bangkok. Usually, Thais call the Faculty of Medicine Siriraj Hospital, "Siriraj" for short. It is an autonomous university under the Ministry of Education and a non-profit organization, with the vision to be "a Medical Institute of Excellence." Main missions are to produce medical students and allied health students, do researches in medical and provide quality medical services. The faculty is the first quality institute that is certified by the Ministry of University. It is also a leader among the medical institutes in Thailand.

Siriraj Hospital is the country's oldest and largest government hospital. Siriraj Hospital was inaugurated on April 26, 1888 by declaration of King Rama IV to build the first hospital in Thailand for treating all Thais without discrimination and was named "Siriraj Hospital" after his Royal Highness Prince Siriraj Kakutabhan, one of the King's loved sons who was ill with dysentery and soon passed away. Two years after, the first official medical school of Thailand was established at Siriraj Hospital and later was granted the name as "Royal Medical College," which after has been transformed to become Faculty of Medical Siriraj Hospital, Mahidol University.

Siriraj has been closely connected to the monarch since its first inauguration. His Royal Highness Prince Mahidol of Songkla, father of the current King, was appointed to be the director of the Department of University in 1923 and was one of the important persons to develop and improve medical curriculum and public health in Thailand. All Thais have honored him as "Father of Modern Medicine and Public Health of Thailand." To commemorate his passing on September 24, 1929, all Thai health organizations will pay tribute





to His Royal Highness Prince Mahidol of Songkla on 24<sup>th</sup> September and lay a wreath at his monument which is located at Siriraj Hospital. The hospital has also provided medical treatments to members of the royal family attentively and loyally, including our King.

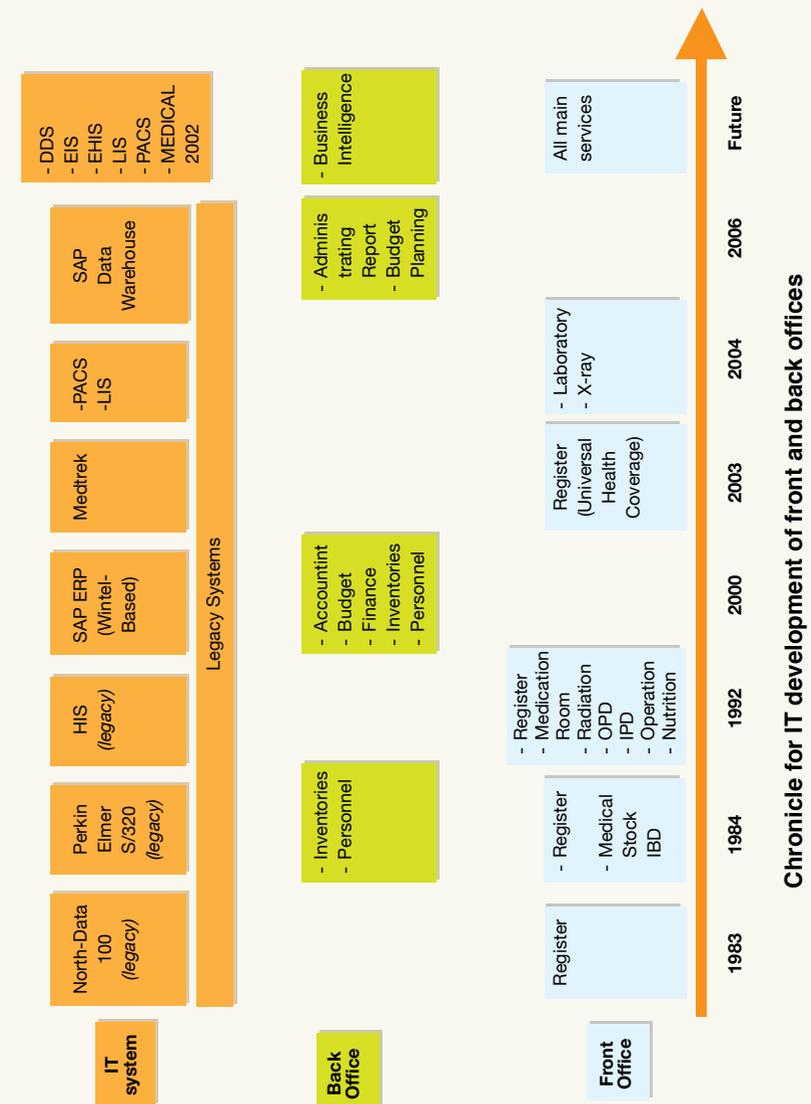
Currently, Siriraj Hospital can accommodate 2,198 sick-beds and receive more than 6,000 outpatients a day or 2.4 million people a year and more than 85,000 inpatients a year. It is certified by the Hospital Accreditation and received many awards, such as Reader Digest Trusted Brand Award 2007 and 2008.

### Changes and Information Technology Development: From Past to Present and Future

Because of the determination of Siriraj to reach their vision and missions and manage changes of our country and the world, Siriraj administrators' give priority to develop IT systems to be the foundation of administration, academic, and medical services. Guided by industry's best practice, front and back offices have been the main parts of Siriraj in installing IT systems and will be further extending in the future, as shown below.

**Front Office.** Front office was the first part of IT development in Siriraj Hospital. In 1983, North-Data ND-100 Compact computer was used to register and keep medical record and statistic of patients' data. In 1984, Perkim Elmer S/320 and its accessories were used in many systems, including register, medical record and medical statistic, medical stock, 20 inpatient units, inventories, and personnel. It also supported education system and statistic analysis using computers. To serve increasing demands of IT system, Siriraj Information and Technology Center was established in 1989.

Because of reputation of Siriraj Hospital, the number of patients was increasing. Siriraj needed IT system that was specified in hospital system. Therefore, Hospital Information System (HIS) which was the most sophisticated system at that time, was installed in 1992 to serve main services of front office, such as register, medical record and medical statistic department, medication rooms,





financial system, outpatient system, inpatient system, etc. The receipts were also changed from writing by hand to printing from computers which decreased time and errors.

In 2002, the universal health coverage project was started as a result of an enactment of the National Health Security Act. The Siriraj's Primary Care Unit was established. The Medtrek, an offshelf HIS package, was also established to serve clients of the project for registering medical record, prescribing medications and labs and keeping records of medications that are given to patients and results of patients' laboratories, as well as to serve a strategic pilot project for replacing the legacy HIS of Siriraj.

Although IT system for front office was extensively developed, reporting results of laboratory and x-rays still was underdeveloped. Thus, Picture Archival and Communications System (PACS) and Laboratory Information System (LIS) have been developed since 2004. PACS is a system for pictures of medical x-rays. Health care providers can see the X-ray results of patients via 1,000 PCs of Siriraj network. X-ray results are kept in electronic files. It is convenient to find the results and compare the previous X-ray results. It also decreases space to keep patients' x-ray films. LIS is a system that provides laboratory results of patients and keeps the records in computer files. These two systems work connect to other systems in Siriraj using Health Level Seven (HL7), a world-wide standard for interfacing healthcare information systems.

All IT systems in Siriraj both front and back office are connected to provide more useful data for personnel and administrators. LIS, PACS, MEDICAL 2020, Billing Itemization System for operation system, and Front Office - Hospital Information System (eHIS) which will be installed to use instead of HIS will be further developed. It will be more updated, accurate, effective and suitable for the number of clients that is continuously increased and missions of institute.

**Back Office.** In 2000, Thailand faced with economic crisis. Many universities which were under government needed to change to be autonomous universities. Certainly, Siriraj, one of government faculties in Medical University, had to change its structure to be a part of autonomous university under Ministry of Education and needed

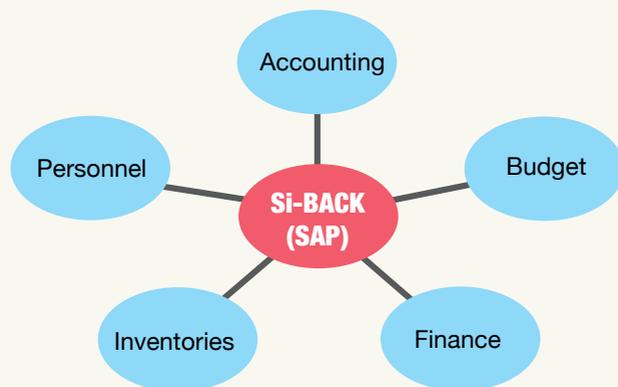
to change their accounting and finance system from cash method to be accrued basis method in order to have reliable finance information. To serve the policy effectively needed quality IT systems to process and report an updated accounting and finance status of institutes. In addition, increasing number of Siriraj's personnel, clients both patients and students, and missions were challenges. Back office system in old fashion method was ineffective and needed to be changed. Dr. Soranit Siltharm, a former Dean of Information technology and a current Vice President for Policy and Informatics Technology said *"Siriraj is huge organization with many personnel and budget more than 10,000 million Baht. There are many inventories and materials to purchase per day. We also face with problems related to how to manage and keep our data that are overwhelmed, so we need IT systems to manage our data."* With the vision and supports of administrators, such as Dr.Piyasakol Sakolsatayadorn, Dr.Soranit Siltharm, Dr.Pradit Somprakit, Dr.Ubolrat Santawat, and Dr.Bordin Sapsomboon, etc., Back Office Project (Si-BACX) has been developed since 2000 to serve the demands and changes and it became a **"big change"** of Siriraj.

This project is a major strategic IT project that forms a basis of new management system that provide correct, complete, and updated data for administrators, in timely fashion. The System Application and Product in Data Processing (SAP), a licensed software that is world-class Enterprise Resource Planning (ERP) for business management, was installed to develop accounting, budget, finance, inventories, and personnel systems, as shown in diagram below. The system can create monthly accounting and finance





reports, such as general ledger, cost accounting, budget, cash management, fixed assets, and financial reporting, etc. Data from the project are very useful and support decision in administration level.



Later, in 2006 - 2007, SAP and Business Intelligence (BI) were further developed to create administrating reports and simulation of digital budget planning. It is the first step of Business Intelligence that is widely used in private organizations in Thailand and other countries. With the effort of the teams in the project and cooperation of Siriraj's personnel, Siriraj Back Office Project won Thailand's ICT Excellence Award 2008 in the category of Business Enabler: Government Sector. It is a proud award and drives Siriraj to continue developing their IT systems.

Siriraj plans to further develop Budget Planning and Simulation (BPS) and Business Intelligence which provide updated and accurate data that are linked with all systems for administrators. Business Intelligence can provide reports about finance, asset, inventories, medication and material status and compare growth development of organization and trends. It is an effective instrument for decision making of administrators and a foundation of Decision Support System (DDS) and Executive Information System (EIS) in the future. Data also are useful for doing researches and determining health policies and strategies of institute and the nation.

### Learned Lessons Leading to Success of Siriraj's IT Systems

Due to long history in IT development, Siriraj has had many experiences and learned lessons to strength them in developing further IT systems. Factors leading to success of IT system of Siriraj are:

*Determination to continuously develop IT and Management Support.* Former and current administrators have had good vision and strong determination to develop IT systems. Because of support from administrators, all personnel have cooperated for success of organization. Budget and resources are allocated effectively for installing and maintaining the systems. Associated Professor Pradit Somprakit, Deputy Dean of Finance, said "It is indispensable for Siriraj's vision, operation and success." Knowledge Management is one of main parts of IT development. Siriraj has good strategy to keep records of processes of IT development, problems that personnel have faced and errors of systems. These records are considered in meeting of committees and are solved by person who is involved.

*Change Readiness and Response to Changes.* Administrators are sensitive to changes and manage them in effective ways. Siriraj also has good strategies to manage resistance of personnel. Change management has been processed simultaneous with IT and human resource developments. Personnel are prepared for changes and their new working methods. Computer and English skills of personnel are enhanced. Personnel are added values to be part of committees and team, so they commit to work and put efforts in the success. IT personnel provide Helpdesk to solve any errors and problems about computer and IT



Seniority



Integrity



Responsibility



Innovation



Respect



Altruism



Journey to excellence  
and sustainability

systems. IT personnel are also enhanced their skills about the ERP and complex systems as well as learning from outsource company.

*Siriraj Culture.* Siriraj culture is one of key successes in missions and sustains growth and development of organization. Administrators and staffs mentioned the success of Siriraj in IT because “We are Siriraj.” Siriraj culture is explained as acronym of Siriraj:

More than 25 years of IT development, Siriraj is still determined to develop updated, effective IT systems. Learned lessons and experiences in success and failure along its journey will be an important basis for Siriraj to continuously develop their IT systems in the future to reach Siriraj’s vision and a new project “Siriraj toward International Excellence Centers in Medical.” Siriraj culture and deep respect in Thai Monarchy that always devotes themselves to promote happiness and welfare of Thais also are one of the key factors for Siriraj to achieve the determination of “The Hospital of The Kingdom.”

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