Evolution of Electronic Medical Record Solutions

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This paper introduces Fujitsu's efforts in the area of electronic medical record (EMR) solutions. EMRs play a central role in promoting information technology in the medical arena, which is a priority measure of the Japanese government. Through the evolution of EMR solutions, we have designed and provided solutions that meet the unique characteristics of medical institutions according to their size while also strengthening partnerships with customers through user association activities. The initial task was to achieve uniform management of information within medical institutions, but recently, due to the promotion of regional medical cooperation, it has become necessary to unify medical information in a way that focuses on individual patients. This paper reaffirms the future role that EMR solutions will play in personal health records, a system that we must move toward as record use evolves from an approach based on an individual's illnesses to one based on his or her total well-being.

1. Introduction

Japan, like many countries throughout the world, is faced with a declining birthrate and aging population, which is placing considerable strain on its social insurance system—the basis of Japanese society. Public health expenditure now exceeds 34 trillion yen and the burden of providing latter-stage elderly healthcare is increasing. As a result, Japan is faced with a variety of challenges, such as reorganization of national health insurance, separation of dispensing and prescribing functions, and introduction of a nursing-care insurance system. At the same time, healthcare is becoming a matter of deep concern among the Japanese people. This is reflected by a rise in health consciousness, greater visibility in medical care, implementation of informed-consent practices, increase in medical malpractice cases, and diversification of individual needs.

In light of this situation, the Ministry of Health, Labour and Welfare[1] and other ministries in Japan are working to restructure the medical insurance system and draft and implement national policies such as the "Grand Design for Information Utilization in Medical Care, Health Care, Nursing Care, and Welfare Sectors." This promotion of information technology (IT) is centered on electronic medical record (EMR) systems. Meanwhile, Fujitsu has been expanding its business in EMR-based medical information systems, and with a current market share of 37%, it is the industry leader in Japan.

In this paper, I first take a look at government policies that are closely related to medical information systems[2] and describe the requirements of EMR systems on the basis of published guidelines.[3] Next, I introduce Fujitsu's EMR solutions based on the concepts of "growing together with the customer" and "placing priority on safety and security." I describe the creation of packaged EMR products, the development of non-

customized EMR packages, and the provision of design, implementation, and operation services in support of these EMR solutions. Finally, I touch upon the shape of things to come and describe a vision for expanding the EMR system for hospital use to an electronic health record (EHR) system for regional use and a personal health record (PHR) system for individual use with the ultimate goal of creating user-centric information services.

2. Japanese medical policies and Fujitsu's healthcare efforts

The correlation between Japanese medical policies and Fujitsu's healthcare efforts is shown in **Figure 1**.

2.1 Japan's national IT strategies[1), 2)]

In 2001, the Japanese government announced the "e-Japan Strategy" as a national IT policy concentrating on e-government and the promotion of IT in healthcare-related fields. Then, on the basis of this strategy, the Ministry of Health, Labour and Welfare announced its "Grand Design for Information Utilization in Medical Care, Health Care, Nursing Care, and Welfare Sectors" and established the first set of numerical targets by declaring that "EMR systems should penetrate at least 60% of all Japanese hospitals with 400 or more beds and at least 60% of all medical clinics by 2006." To this end, subsidies were established for promoting the adoption of EMR systems. However, although EMR system introduction in the market did increase, at least for some time, the industry was still short of this 60% target as of fiscal year 2009.

The e-Japan Strategy was followed by e-Japan Strategy II (2003) and the New IT Reform Strategy (2006) that emphasized the following measures:

- Promote further application of IT to medical care through online processing of medical insurance claims.
- Promote EMR use.
- Promote coordinated use of medical information.
- Promote ubiquitous healthcare.

More recently, a new strategy has been set

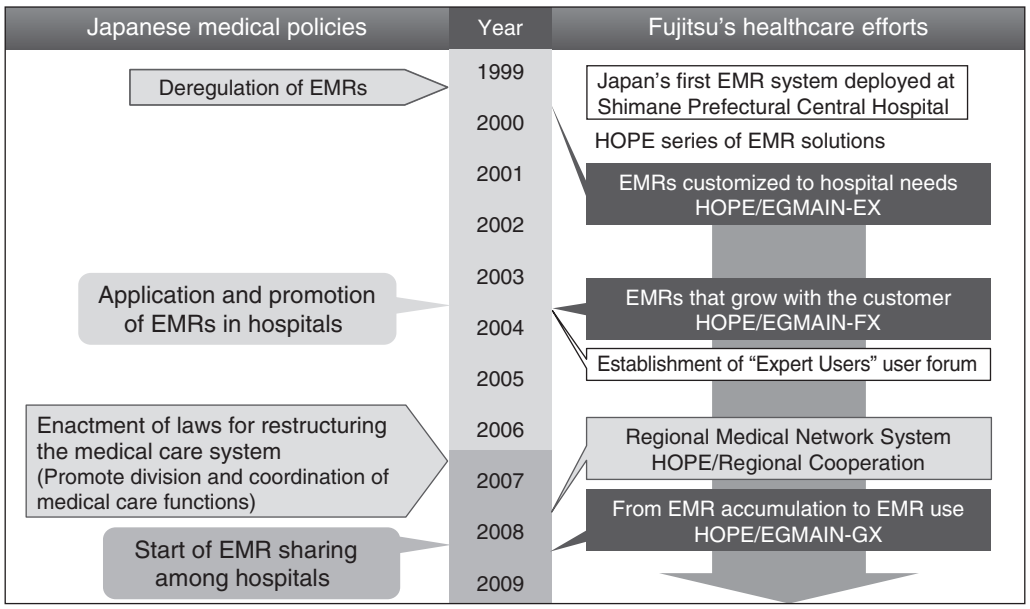

Figure 1
Japanese medical policies and Fujitsu's healthcare efforts.

forth toward the realization of a Japanese EHR system in the form of *i*-Japan Strategy 2015 (2009). This strategy aims "to create a citizen-driven, reassuring, and vibrant digital society" and to achieve "digital inclusion and innovation."[2] The main action items toward achieving a Japanese EHR system are as follows:

1) Establish a mechanism for safe and secure information coordination between medical institutions via network connections.
2) Enable healthcare information from medical institutions to be accessed and managed by individuals and to be presented to medical and healthcare personnel to reduce errors in medical care, prevent unnecessary testing, and enable individuals to select their healthcare services.
3) Achieve electronic delivery of prescriptions and feedback of drug-dispensing information to medical institutions.
4) Collect anonymous healthcare-related information on a national scale for epidemiological studies.

In addition to the above, the New Growth Strategy drafted under the Democratic Party of Japan (DPJ) administration envisions Japan as a major power in healthcare driven by "life innovation." The strategy here is to "foster industry growth to meet the demand for medical, nursing care, and other health-related services and create jobs: 2.8 million new jobs and a new market of roughly ¥45 trillion."

2.2 Fujitsu's healthcare efforts in advance of policies

In 1999, two years before the launch of e-Japan Strategy (2001), the government issued its first approval of EMRs in a notification entitled "Storing Medical Records on Electronic Media." This opened the door to the construction of a unified patient information database centered around EMRs. In the same year, Fujitsu successfully deployed Japan's first EMR system in Shimane Prefectural Central Hospital, jumping ahead of other companies in this field.

Next, on the basis of the experience gained at this hospital and seeing that the time was ripe for further penetration of EMR systems, Fujitsu developed and packaged the HOPE/EGMAIN-EX EMR solution in 2000 and began offering it to the market.

Then, in conjunction with e-Japan Strategy II (2003), with the aim of expanding EMR systems from large-scale hospitals to the large number of medium-sized hospitals, Fujitsu placed its HOPE/EGMAIN-FX solution on the market as a One-Stop Solution product (described later). HOPE/EGMAIN-FX was a non-customized type of solution providing EMRs, medical accounting functions, and packages for various departmental systems at a relatively low price. Through this solution and user-related activities such as the Expert Users user forum, Fujitsu increased its EMR system market share significantly.

Next, as measures related to the restructuring of the medical care system were passed on the basis of Japan's New IT Reform Strategy (2006) and as national universities took on corporate status, Fujitsu placed its next-generation HOPE/EGMAIN-GX EMR system package, which combines the key features of the EX and FX solutions, on the market in 2008.

As a leading company in the healthcare IT field, Fujitsu has been able to anticipate national policies and market trends and achieve early provision of solutions that medical institutions (Fujitsu's customers) and patients need. This is what constitutes Fujitsu's "DNA" now and will continue to do so in the years to come.

3. Definition of EMRs

The Japanese Association of Healthcare Information Systems Industry (JAHIS) has defined EMRs in terms of five levels.[4]

1) Level 1

Electronic patient information that is handled within a department

Typical system: clinical-testing information

system

2) Level 2

Electronic patient information that is handled across multiple departments

Typical systems: ordering, HIS-PACS

3) Level 3

Patient information that is (mostly) handled within a single medical institution

Typical system: integrated patient information system

4) Level 4

Patient information that is handled across multiple medical institutions

Typical system: regional medical network system

5) Level 5

Healthcare-related information that is handled in addition to medical-care information

Typical system: lifetime healthcare information management system

At present, most EMR systems deployed in medical institutions are of the level-3 type. Recently, however, there has been a growing need in regional medical care to divide up facility functions and achieve greater cooperation among facilities. Calls are therefore being made for level-4 EMRs so that medical information held by multiple facilities can be referenced using the patient's identity as a search key. There is also a growing demand for a lifetime healthcare information platform (EHR, JAHIS level 5) that can store and make available not only a patient's medical-care information but also his or her healthcare and nursing-care information. A brief overview of EMRs is given in **Figure 2**.

4. Fujitsu's EMR solutions

4.1 Solution concept

Fujitsu's EMR solutions are based on two concepts: growing together with the customer and placing priority on safety and security. The first concept underscores the One-Stop Solution,

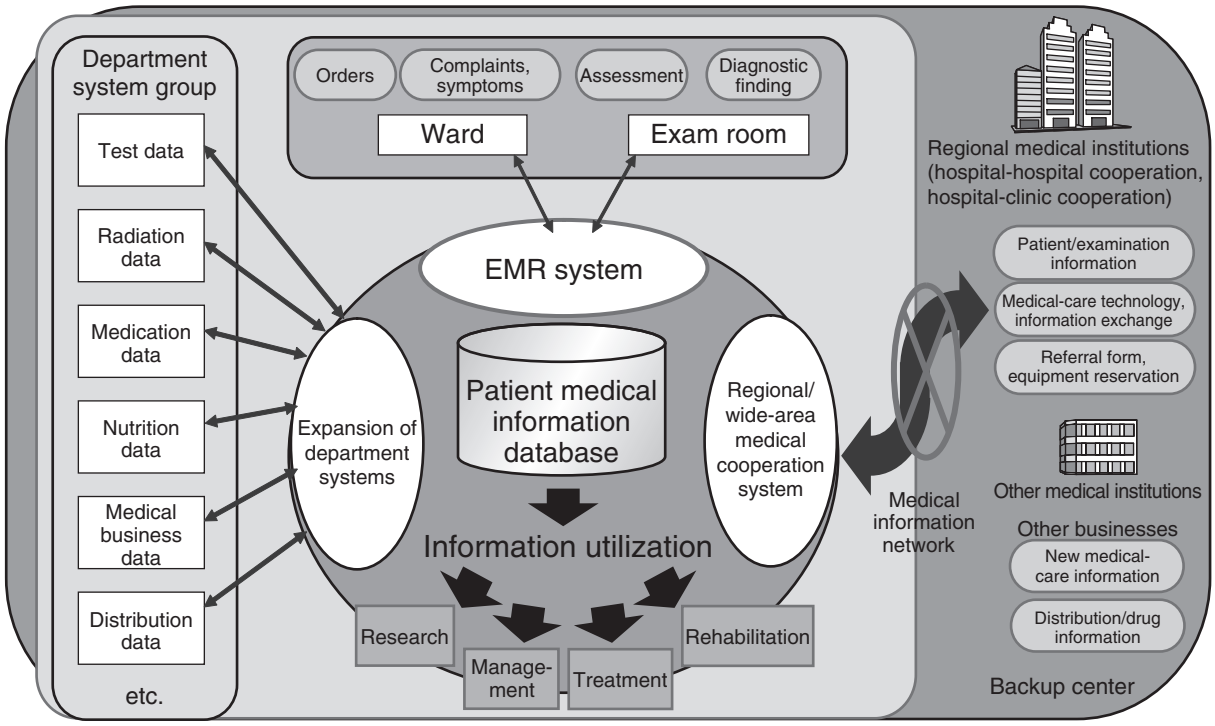

Figure 2
Brief overview of EMRs.

which is based on the application of packaged products, and the Expert Users user forum and the University Hospital Common Solution. These solutions are outlined below. The second concept reflects Fujitsu's commitment to safety and security in packaged products that handle medical information and individual patient information. At Fujitsu, the Guidelines on Secure Management of Medical Information Systems, Ver.4.1[3] established by the Ministry of Health, Labour and Welfare provide the basis for assessing product quality, and only those products that a review board determines do conform to those guidelines are assigned the HOPE logo as high-quality products.

4.2 Specific solutions

4.2.1 One-Stop Solution

In the early stages of EMRs, solution packages were customized to fit the needs of individual large medical institutions like university and municipal hospitals. Deploying such customized packages required a relatively high IT investment. As a result, early EMR systems were beyond the reach of private and medium-sized hospitals, and the system penetration diminished as smaller hospitals that wished to adopt EMRs were forced to either apply for subsidies or reduce the system scale. Thus, with the aim of furthering EMR penetration, Fujitsu developed a One-Stop Solution featuring non-customized EMR system packages covering the main departments within a hospital. This solution—an industry first—could be implemented at a relatively low price.

At that time, however, non-customized systems were not always well received in the construction of medical information systems because operations, administrative tasks, and functions often differed from one medical institution to another. In response, Fujitsu began to offer a new growth-type solution that enabled package functions to be set and modified as needed at system construction time using a parameter-based scheme and that provided new and upgraded functions on a yearly basis. Thanks to this solution, EMR system penetration in private and medium-sized hospitals began to accelerate, enabling Fujitsu to increase its EMR market share dramatically. A successful model had therefore been established in the healthcare business.

4.2.2 Expert Users forum

The Expert Users forum targets users of Fujitsu's non-customized solutions. Centered on an executive meeting, it consists of a function-upgrade forum, implementation/operation forum, and database forum. The function-upgrade forum votes on which functions should be added or upgraded in the implementation of non-customized EMR systems; the implementation/operation forum shares case studies of system deployment and operation, system content, etc. among users; and the database forum discusses the effective use of stored information (**Figure 3**). The purpose of establishing the Expert Users forum was to promote the evolution of EMR systems and methods of using them and improve the quality of healthcare services in Japan. The forum presently consists of 214 member facilities that Fujitsu considers to be valuable customers and partners.

4.2.3 University Hospital Common Solution

In the history of medical information systems in Japan, university hospitals have been a driving force behind the adoption of IT systems. This is because they have been top institutions of learning in medical care, medicine, nursing science, and pharmaceutical science, and they have been the recipients of national investment covering the expenses for medical information equipment and experimental research as advanced institutions in medical care and clinical research and education. As a result, EMR-based medical information systems have been created and cultivated at university hospitals,

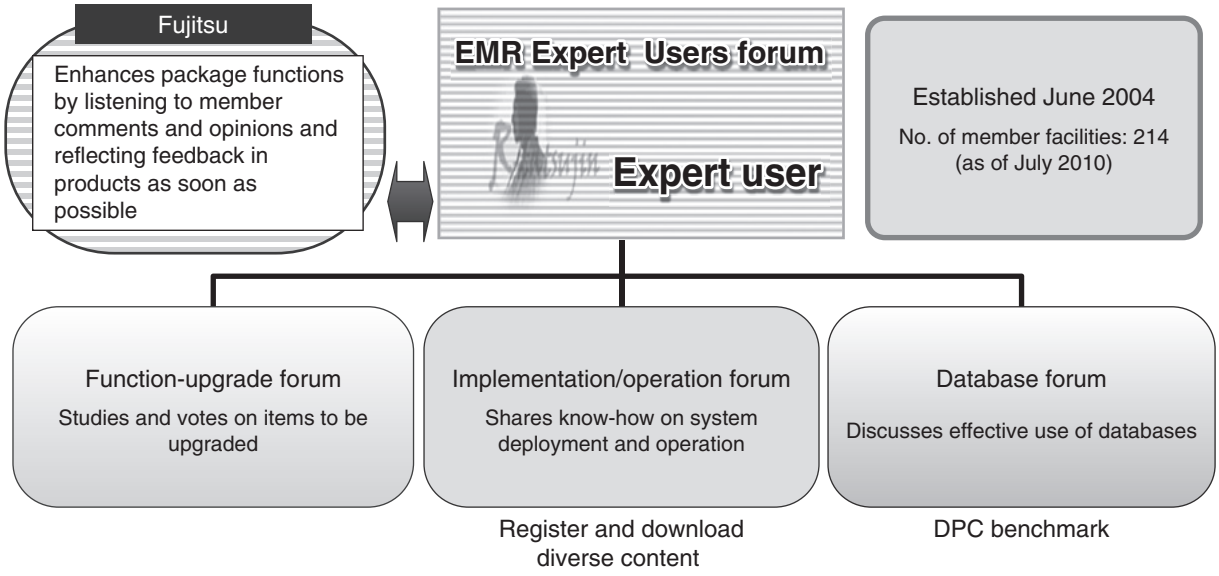

Figure 3
EMR Expert Users forum.

and those systems have provided a foundation for the spread of EMR systems to private and regional medical institutions. However, as times change and national universities in Japan take on corporate status, a rapid transition is taking place from IT investment based on grants and subsidies to IT operations based on independent accounting systems (involving cost cutting, cost effectiveness, etc.).

In the past, it was common for EMR systems in university hospitals, while based on packaged products, to be highly customized in terms of developing new functions or upgrading existing ones. In addition, a university-hospital system might consist of 1000 to 2000 client terminals, a large-scale network, core servers, and a group of department servers. This and the highly customized nature of these EMR systems made for a large IT investment. To alleviate this problem, Fujitsu launched its University Hospital Common Solution in fiscal year 2007 by creating a new package based on its HOPE/EGMAIN-GX EMR system, which represented an accumulation of know-how gained in the private sector. This was accomplished by adding new functions or previously customized functions considered to be commonly needed by university hospitals. This solution made system construction more cost efficient and greatly improved product quality (in the past, research-related components and customized functions had a tendency to degrade quality). As a result, Fujitsu currently has the biggest share (48%) of the Japan university-hospital market in this field.

4.2.4 Other key solutions

1) Promotion of infrastructure industrialization

Fujitsu is currently promoting the industrialization of infrastructure services with the aim of streamlining the creation of estimates from the sales department and arrangement of hardware and devices, shortening product delivery times to customers, and preventing the omission of components or products. Since 2003, it has been creating product templates for hardware, programs, and business applications and has been providing a build-to-order (BTO) service for assembling and installing products.

As of the first half of 2009, Fujitsu had shipped 2132 servers loaded with BTO services. Fujitsu aims for more innovations in this field by integrating BTO know-how with infrastructure industrialization.

2) Integrated support solution

An EMR system is a 24/7 (24 hours a day, seven days a week) non-stop system tied directly to onsite medical consultation and treatment. The reliable operation and maintenance of the system can therefore be viewed as a lifeline in a medical institution, and an operation support solution that can minimize the effects of a system problem on the patient is therefore absolutely necessary. Fujitsu has been offering its Integrated Support Solution since fiscal year 2009 with a focus on one-stop EMR support by systems engineers (SEs) skilled in EMR systems and operations.

3) Specialist training

The introduction of an EMR system requires a professional approach, which means that SEs and sales specialists must be trained accordingly. Such personnel must not only learn good business skills, but also be taught how to promote projects by proposing one-stop, non-customized solutions, explaining development-consignment conditions, and describing how operations can be improved and what effects can be expected. As part of its company-wide human resource development program, Fujitsu offers a healthcare professional training program and certification system. Specifically, it offers the following certifications based on writing tests, tests of practical skills, journal-paper reviews, and oral examinations that assess the individual's knowledge of hospital operations and experience in consulting and project management in addition to traditional product knowledge and development abilities.

- One-stop specialist (SE)
- EMR sales specialist (sales)

Target: Fujitsu Group, SE firms, Fujitsu partners

5. Shape of things to come (from EMRs to EHRs and PHRs)

The use of EMRs in medical institutions is entering a period of rapid expansion from the original deployment of IT within hospitals to the sharing of patient information among regional medical institutions (among hospitals and between hospitals and medical clinics). The reason for this transition lies in the growing need to share patient information as functions come to be divided among medical institutions from the original onset of symptoms (as observed by a family doctor at a medical clinic) to emergency care at a hospital during the acute period (advanced medical care in an intensive care unit, surgery, etc.), rehabilitation during the recovery period, and home/nursing care during the maintenance period. In particular, the need for EHRs is especially strong in regional clinical paths, as in the case of strokes and other designated diseases. The idea behind this expansion from EMRs to EHRs is shown in **Figure 4** and the concept of a regional clinical path, as a specific example of applying EHRs, is shown in **Figure 5**.

Fujitsu has developed and provided the HOPE/Regional Cooperation package as a means of sharing electronic patient information through referrals and reverse referrals among medical institutions that serve different functions. Moreover, in April 2010, it began to provide a coordination system as a regional medical care network among multiple medical institutions (including those using EMR systems from other companies) based on a standard format (SS-MIX system). Fujitsu's overall plan is to move beyond patient information sharing among only medical institutions and develop and provide an individual-oriented PHR solution that integrates medical-care- and healthcare-related information (**Figure 6**). Finally, with the coming of the software-as-a-service (SaaS) and Cloud computing era, Fujitsu aims to provide healthcare, medical-care, and nursing-care information services toward the realization of a

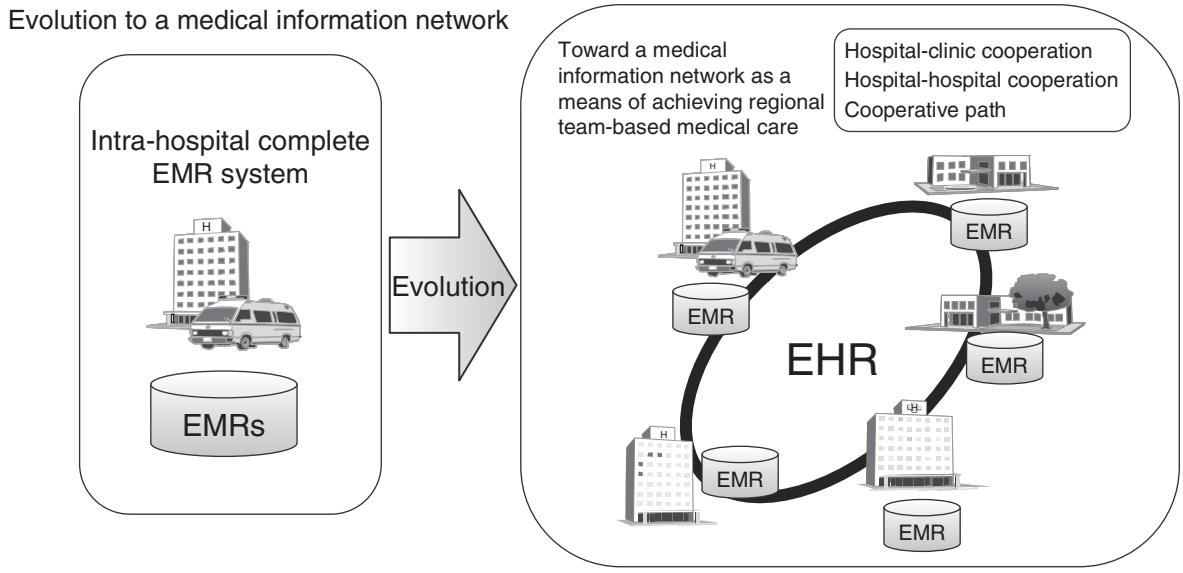

Figure 4
From EMRs to EHRs (from point coverage to area coverage).

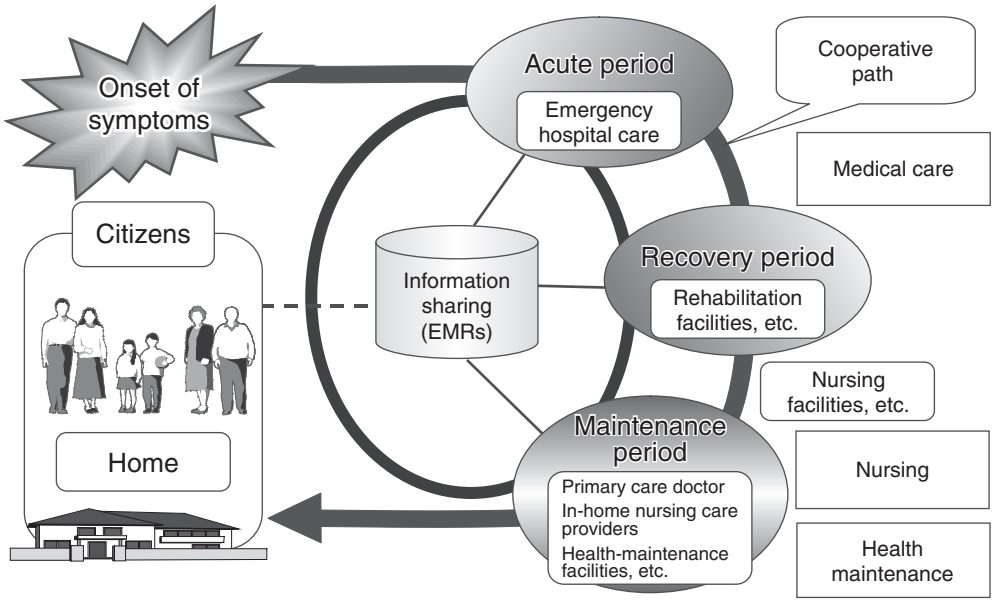

Figure 5
Regional clinical path.

long-lived society.

6. Conclusion

In this paper, I described medical-care and healthcare-related policies in Japan and outlined EMR solutions that lie at the core of medical information systems supporting those policies. The healthcare issues that Japan is now facing as the most long-lived society in the world are being viewed by China and other countries in East Asia as issues that they themselves will be facing before long, so they are looking with keen interest at the healthcare-related IT that Japan has been cultivating. In Japan itself, a revolution is

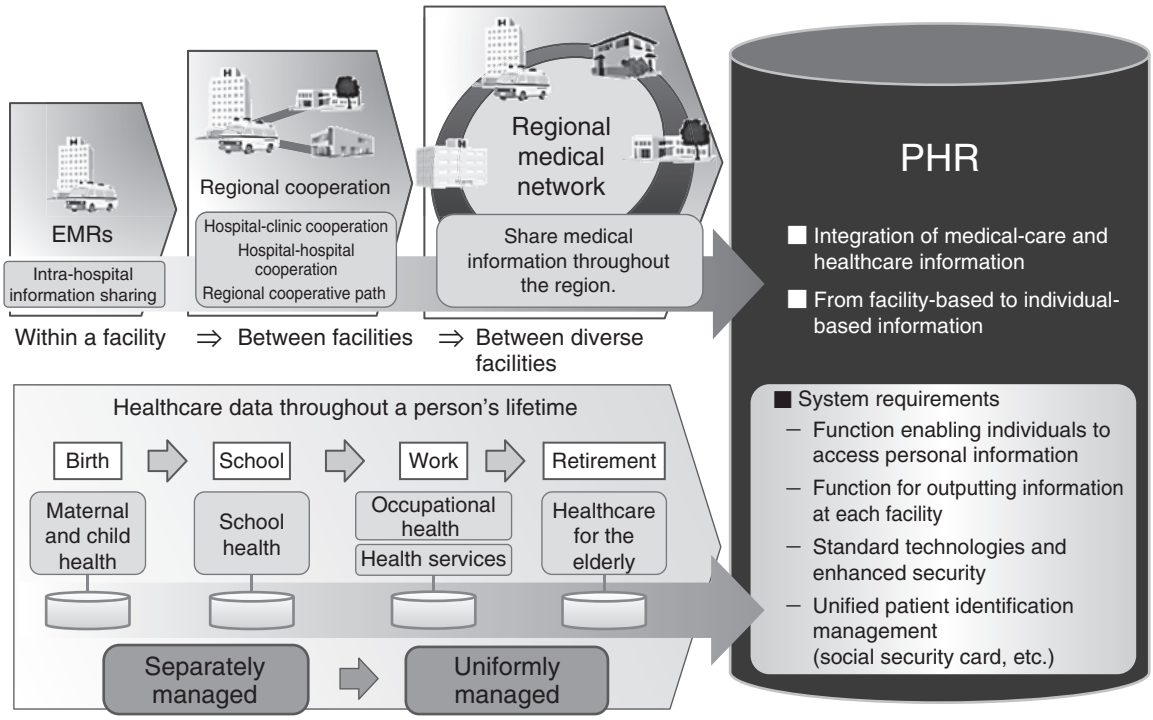

Figure 6
From EMRs to EHRs and PHRs.

taking place in the way that IT is being deployed in society. Traditionally, IT hardware, software, and services have been provided separately, and healthcare IT has been promoted on a hospital-by-hospital or region-by-region basis. Now, however, IT is changing to a new format with the aim of creating a human-centric society based on a platform on which the user (healthy individual, patient, or family) takes center stage.

Looking forward, Fujitsu will continue to pursue its vision of growing together with the customer. It plans to do this by providing safe and secure systems through its HOPE brand of products based on extensive experience and know-how in EMR solutions and by developing new solutions toward user-centric services that include medical-care, healthcare, and nursing-care information as well as information related to other industries, all provided using SaaS and Cloud technologies.

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