

Fujitsu's Ongoing Activities in Healthcare Field

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As a pioneer in the application of information technology (IT) in the healthcare field, Fujitsu was the first company in Japan to develop a software suite for medical institutions. Ever since, it has advanced together with its customers. At first, it was engaged in introducing IT to departments involved in work such as insurance claims and accounting and clinical laboratory examinations. As IT use in individual departments progressed, it moved toward overall integration and developed a computerized physician order entry system. Now, it is digitizing patient medical records that were originally handwritten on paper by doctors, leading to the development of electronic medical records. During all this progress, target markets expanded from the medical field to include health, nursing, and the healthcare industry. Today, as it strives to address the familiar concerns of public safety and security, Fujitsu is playing the role of a social infrastructure provider. This article outlines this history and discusses today's healthcare solutions and future ones.

1. Introduction

Fujitsu's information technology (IT) for the healthcare field is now being used in about 16 000 medical institutions in Japan, and its electronic medical record (EMR) systems for large hospitals with 300 or more beds have a 40% share of the market, making Fujitsu the leader in this industry.

The healthcare environment is currently going through major changes. They are being driven by several factors, including a growing awareness of healthcare and medical care among the public, the rapid approach of the "super-aged" society, strong demand from the public for safety in medical care, and the sudden rise in medical care costs. At the same time, problems such as a shortage of doctors, long working hours for hospital-based doctors, and a crisis in the emergency medical care system are becoming increasingly worse, prompting talk of a breakdown in medical care.

In addition, the pattern of disease is making a major shift from infectious diseases to lifestyle-related diseases as chronic conditions such as malignant tumors, cardiovascular diseases, cerebral vascular diseases, and diabetes become the leading causes of death. Diabetes, for example, can easily lead to complications like cerebral infarction, and it is likely to increase in severity to the point of requiring artificial dialysis. Thus, in addition to the prevention of lifestyle-related diseases, importance is being placed on treatment that makes use of advanced medical techniques including surgery and chemotherapy, and the demand for advanced and comprehensive medical services is growing.

Against the above background, healthcare IT is shifting from an emphasis on quantity, as in making the work of healthcare personnel more efficient and preventing omissions in medical-services billing, to quality, as in improving patient services and safety. In fact, EMR

systems have already evolved into operations platforms supporting hospital management and have become so intertwined in all sorts of daily work and administration that hospitals could not operate without them.

Thus, from here on, it is important that healthcare IT expands into a system that directly supports the lives of patients by linking the digitized medical records of various medical institutions, integrates health and lifestyle data, and uses such data in a patient-centric manner.

This paper describes how Fujitsu IT in the healthcare field has evolved over the years and describes its expansion toward healthcare solutions in the face of current problems.

2. Activities to date

2.1 From department-specific systems to order entry systems

In the early 1970s, Fujitsu began to use mainframe computers and minicomputers to drive medical accounting systems and clinical laboratory systems, marking the beginning of Fujitsu healthcare IT. Then, in 1976, capitalizing on the experience and know-how gained in operating those systems, it developed the HOPE hospital management system package. It targeted operations related to reception desk accounting, medical insurance billing, and medical statistics, considering that the main technical issues at that time were how to improve the response of reception desk accounting to minimize patient waiting and how to speed up the processing of the large amounts of data in medical insurance billing. These systems were followed by the gradual development of medical systems for specific departments, such as the laboratory-testing department and pharmacy. The target of support provided by healthcare IT therefore expanded from doctors and nurses to other occupations.

Following these developments, a major transition period began in the mid-1980s with the development of physician order entry systems. As

department-specific systems began to spread, the vertical nature of these systems began to pose a problem. Traditionally, a specialized department like a pharmacy or testing laboratory would take a request (order) such as a prescription or test request written by a doctor and manually enter that data into its system. As a result, data processing was time consuming, troublesome, and error-prone. A system that let a physician enter such data directly into an order entry system from the very start enabled the data to be sent instantaneously to the relevant departments, which could then automatically process the request. In this way, request data could be immediately and correctly conveyed, which made operations more accurate and efficient and healthcare much more efficient overall. This system was then enhanced to allow the two-way transfer of information by enabling department-specific systems to automatically return test results, reports, and other data to requesting physicians. This marked the completion of an integrated order entry system that came to be used by many hospitals throughout Japan.¹⁾

2.2 EMR era

At the start of the era of order entry systems in the latter half of the 1990s, there were still many indications of inefficiencies in the tasks carried out by healthcare personnel. For example, a physician entering order entry information, which constituted part of a patient's medical record, would also enter the same information onto a handwritten paper medical record at the same time. Likewise, results or reports received from a specialized department would also be attached to a paper record. At the same time, healthcare personnel began calling for unified management of patient information to enable information sharing. The time was therefore ripe for the introduction of an EMR system that could digitize handwritten paper records.

At that time, however, Japan's Ministry of Health and Welfare (now the Ministry of

Health, Labour and Welfare) would not approve electrical storage of medical records, which meant that operations could not be solely based on EMR systems. The situation changed, however, on April 22, 1999, when a notification entitled "Storing Medical Records on Electronic Media"²⁾ from the bureau chiefs of the Health Policy Bureau, Pharmaceutical Safety Bureau, and Health Insurance Bureau of the Ministry of Health and Welfare gave approval for operations by an EMR system. This notification stipulated that EMR systems should satisfy the three key conditions of authenticity, human readability, and preservation.

Fujitsu had already been designing and developing an EMR system prior to this approval, and in August 1999, the Shimane Prefectural Central Hospital took delivery of this system, becoming the first user to implement EMRs.

To enable order entry in a similar manner to that in the past, this EMR system also supported the input of patient's complaints, doctor's observations, and pathological evaluation via a user interface consistent with a doctor's thought process. The system could also link with data from various types of medical equipment installed

in the hospital. In this way, Fujitsu's healthcare IT grew into an integrated hospital information system supporting hospital operations (**Figure 1**).

On the basis of this system's achievements, Fujitsu launched its HOPE/EGMAIN-EX EMR package in 2000.

This EMR system acted as the nucleus of an integrated hospital information system centered on patients' EMRs. It exhibited a synergistic effect by systematically interfacing with 20–30 departmental systems and various types of medical equipment. In the early stages of HOPE/EGMAIN-EX, the introduction target was mostly large hospitals owing to the cost of implementing new IT, and the chosen system implementation format was a package customized to suit the characteristics of each medical institution. Eventually, however, Fujitsu realized that a new business model was needed if its EMR system was to be extended to medium-sized hospitals. This was achieved through a follow-up package called HOPE/EGMAIN-FX, which was launched in 2003. The outstanding feature of this package was a completely non-customized format, which significantly held down costs and greatly improved system quality. The time required

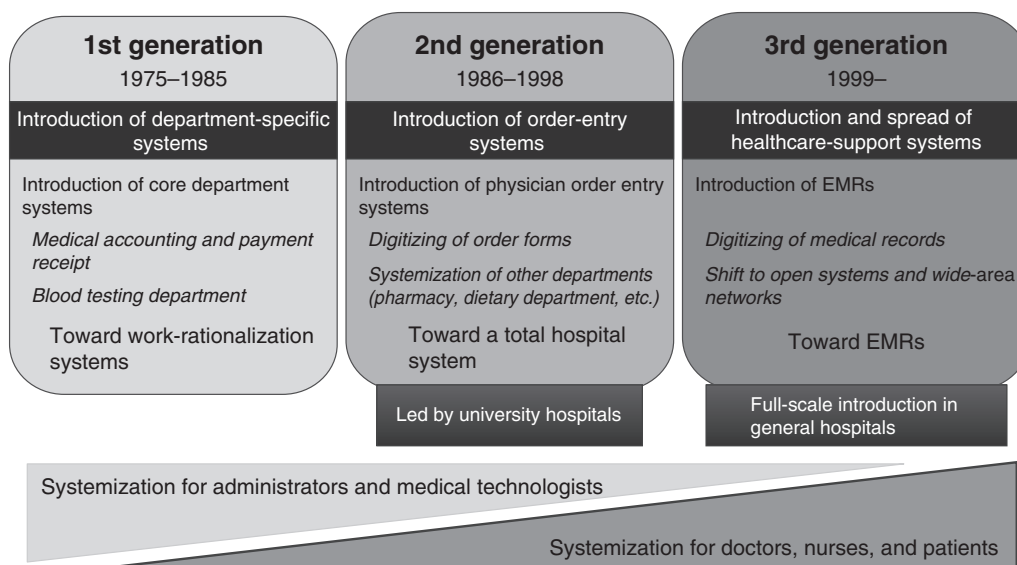


Figure 1
IT history in medical institutions.

to get the system up and running could also be drastically shortened and the labor required to implement the system in the hospital could likewise be reduced. Early implementation of the EMR system in this way meant that the targets set by the hospital using the system could be achieved relatively quickly.

At the same time, the need arose for a mechanism that could promptly reflect a changing hospital environment and diverse needs in the package and that could provide new functions in previously installed user systems. This mechanism was achieved through the establishment of a user forum called "Expert Users."³⁾ In this forum, users investigate system and hospital issues on their own and advise Fujitsu of their findings. Then Fujitsu takes these findings and incorporates appropriate solutions into the package. The forum therefore provides a means of establishing package requirements. There are also cases in which a system operation problem can be solved by some sort of workaround plan. To this end, users share information about devising such solutions, which makes for speedy resolution of system operation problems.

As a result, the package could continue to evolve without becoming obsolete and could promptly respond to diverse customer needs and environmental changes in an inexpensive manner.

This mechanism was instrumental in solving a variety of problems that trace back to the first implementation of Fujitsu's EMR system and was a big factor in expanding EMR to medium-sized hospitals. Then, on the basis of ten years of proven EMR operation, Fujitsu launched the HOPE/EGMAIN-GX package, which is its current healthcare package, in 2008. This package incorporates functions that further enhance the non-customized type of EMR package, which has penetrated even as far as large hospitals, as well as advanced functions for improving the retrieving and browsing of ever-increasing

quantities of EMRs. With HOPE/EGMAIN-GX, Fujitsu aims to improve both user operability and the added value of accumulated medical records. It sees this package as becoming the foundation for regional healthcare coordination systems, which are expected to expand rapidly in the years to come, and for healthcare information systems that will provide functions for navigating a patient's medical services recorded in EMRs.

Regional healthcare coordination systems have recently attracted attention as a means of solving the social problems of an insufficient number of doctors, overworked hospital doctors, and a crisis in the emergency medical care system (where it can take several hours for a critical-care patient to receive medical care). With this in mind, Fujitsu has been providing the HOPE/Regional Coordination System since 2007 in a format that meets the needs of customers.

In the beginning, the function of the HOPE/Regional Coordination System was to provide access to patients' records stored in EMR systems. At present, however, it is rapidly expanding into a system that enables different medical institutions to work together on patients' records and utilize medical data in a patient-centric manner. The HOPE/Regional Coordination System is therefore laying the foundation for the creation of the electronic health record (EHR). The development of this system showed how Fujitsu was able to respond quickly to its customers' problems and work with them to develop a system that met the needs of the times.

3. Solutions system

Fujitsu is developing packages to meet the respective needs of a wide range of medical institutions from specialized hospitals centered on university hospitals to medium-sized hospitals and medical clinics. It is also providing subsystems for the individual departments making up medical institutions and supporting the work of diverse healthcare occupations. At the same time, it is supplying packages for

the nursing and health-insurance fields and promoting the safety and security of patients and the public through total healthcare solutions.

4. Key issues ahead

4.1 EMR operation-support services, operability improvements, and expansion to small and medium-sized hospitals

Since the approval of EMR systems in 1999, EMR introduction has progressed with an emphasis on large hospitals (300 beds or more). Fujitsu's share of this market has reached 40%, which puts it in the top position among the five leading companies. In response to the growing number of users and the increasing importance of EMR systems (as mission-critical systems running 24 hours a day, 7 days a week), Fujitsu recognizes the importance of providing extensive support for the operation phase after a system has been activated. To this end, it treats both activation-support services and operation-support services as products, and it endeavors to improve the quality of the support that it provides. In May 2009, with the aim of reducing the customer's operation load and making the system even safer and more secure, it established the Medical One-Stop Support Center. This support center is continuously connected with the customer's system over a Fujitsu FENICS network to enable the system's operating state to be monitored and preventive measures against problems to be taken. Furthermore, if a problem does occur, the support center has a specialized staff ready to work remotely on finding a solution. In the future, the services provided by the Medical One-Stop Support Center will be enhanced to enable remote provision of upgrades to EMR systems and application of operating system and middleware patches. Furthermore, while it is necessary to add functions to an EMR system to keep up with changes in the healthcare environment, operability is also important for users, most of whom are doctors, considering that an EMR system is used for a considerable amount

of time every day. There are many operations that can cause stress depending on the terminal's response time, the number of clicks, and eye movement during input. Enhanced operability must be carefully pursued taking into account the user's thought processes and usage scenarios. A good balance should be maintained between adding functions and improving operability.

Fujitsu's penetration rate of EMR systems including medium-sized hospitals is only 11%, so from here on, the key to expanding the EMR business is expansion to small and medium-sized hospitals. Such hospitals are in a difficult business environment, and the cost of introducing new IT can be a significant burden, which explains why EMR penetration has not been making much progress here. To improve the penetration of EMR systems in small and medium-sized hospitals, there will have to be a change from "self-introduced EMR systems" to "remotely used EMR systems" in a software as a service (SaaS) or Cloud computing environment.

4.2 Expansion from regional healthcare coordination systems to EHR system

All patient-related data at medical institutions that have adopted EMR systems is being digitized, and healthcare IT platforms are being set up within hospitals. A regional healthcare coordination system could utilize such healthcare IT platforms throughout a region in an attempt to solve problems that affect healthcare. The purpose of such a system would not simply be to release the medical data stored in one hospital to related medical institutions, but would also be to facilitate mutual interaction in the use of medical data to solve a variety of problems. In this way, regional healthcare coordination systems could become the foundation of a Japanese EHR. It is therefore important at this time to make efforts to expand regional healthcare coordination systems while working to expand the use of EMR systems.

4.3 Standardization of healthcare information

In linking the data of regional healthcare coordination systems and linking different subsystems within a hospital, standardized technologies should be used in order to achieve smooth and safe data exchange in a multi-vendor environment. Fujitsu has been participating in standards development for some time, starting with HL7, IHE Profiles, and SS-MIX, and has become an industry leader in healthcare standardization activities. It actively adopts standards in its healthcare products, which makes significant contributions to the penetration of standardized technologies. Promoting standards through industry activities is one of Fujitsu's prime missions.

4.4 Raising the environmental value of products and services

It is clear that growing populations and environmental and resource problems are becoming major worldwide issues, and it is important to use IT to help address these issues.

The Fujitsu Group aims to reduce CO₂ emissions by a total of 15 million tons and help protect biodiversity on the basis of the Stage VI Fujitsu Group Environmental Protection Program covering the three-year period of fiscal years 2010–2012. Specifically, this means that it will work to make its IT equipment more efficient and achieve an environmental-load reduction effect in its IT solutions.

In the healthcare field, Fujitsu provides ten environment-friendly solutions that help reduce CO₂ emissions. For example, its EMR solutions and medical imaging and information systems help reduce the use of paper and film, and the use of networking in medical treatment and medical/nursing billing helps reduce the use of paper and transport-related energy. To give a specific example of a CO₂ reduction effect, the HOPE/Regional Coordination System lets medical institutions schedule tests,

examinations, and medical care at each other's facilities while a patient is being treated. This capability not only achieves efficient use of labor and facilities but also reduces the large amount of energy associated with patient movement by automobile.

Efforts to reduce the load placed on the global environment by medical institutions have begun in earnest through green declarations, the EcoAction 21 Certification and Registration Program (an environmental management system established by the Japanese Ministry of the Environment), and other measures. Fujitsu aims to cooperate with these efforts while listening to the comments and opinions of personnel working in the field.

5. Future outlook

At present, EMR systems managed within hospitals are expanding into patient-centric systems managed throughout certain regions, reflecting a shift from EMRs to EHRs.

In the future, as the use of EMR systems expands and EMRs come to be integrated in a patient-centric manner, nursing and health data will become connected and individuals will become responsible for managing and using that data to support their individual lifestyles. This development will mark a shift from EHRs to personal health records (PHRs).

Before that, however, Fujitsu would like to use IT to support a human-centric society featuring a personal life record (PLR) connecting various types of data related to an individual as managed by companies, governmental bodies, groups, etc. and manage all information concerning a person's life in an integrated manner (**Figure 2**). Achieving such a PLR world will require advances in sensing technologies and mobile terminals to gather the data generated continuously throughout the course of a person's daily life. Fujitsu envisions a society in which data accumulated in this way can be provided as needed in accordance with individual

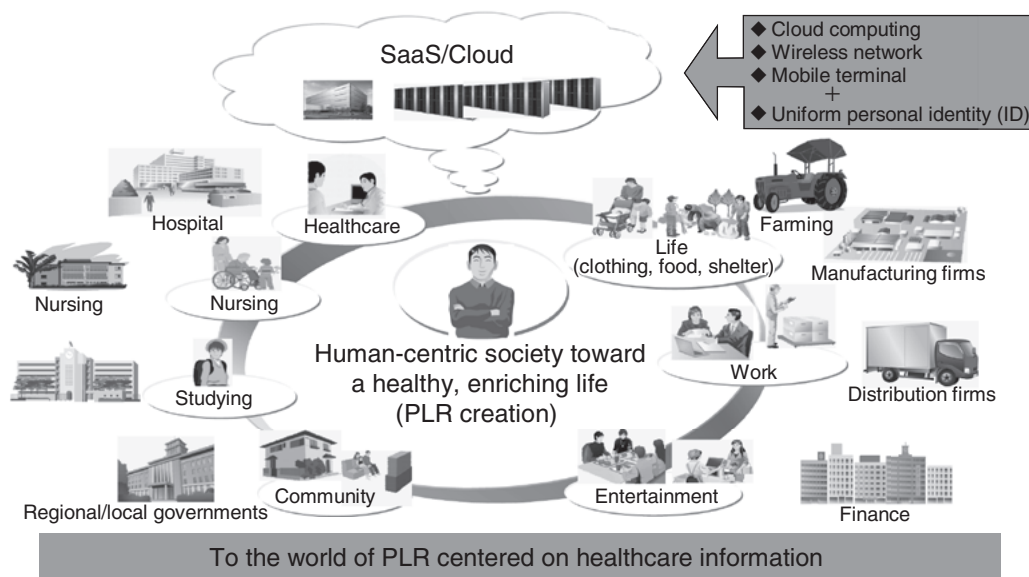


Figure 2
Concept of human-centric society.

characteristics so that an individual can base his or her actions and decisions on health and lifestyle considerations. In such a society, an individual should be able to navigate through life in an optimal manner.

6. Conclusion

In this paper, I looked back at the evolution of Fujitsu's healthcare IT and described the company's efforts toward healthcare solutions of the future based on the issues facing the healthcare industry today. Fujitsu will continue to use IT to promote safety and security in the ever-advancing healthcare field. It will use healthcare as a foundation for supporting all aspects of life through IT while making ongoing efforts to enrich the lives of all people and achieve peace in the world.

In future, we plan to continue working with our customers to bring healthcare to even higher levels of performance for the benefit of patients and society as a whole.

Acknowledgement

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References

- 1) T. Yamaoka et al.: Fujitsu's Development Activity for Medical Information Systems. (in Japanese), *FUJITSU*, Vol. 46, No. 2, pp. 144–152 (1995).
- 2) Ministry of Health, Labour and Welfare: Storing Medical Records on Electronic Media. (in Japanese).
http://www1.mhlw.go.jp/houdou/1104/h0423-1_10.html
- 3) E. Sonoda: Evolution of Electronic Medical Record Solutions. *FUJITSU Sci. Tech. J.*, Vol. 47, No. 1, pp. 19–27 (2011).



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