Current Status of Electronic Health Record Dissemination in Japan

Hiroshi TANAKA*1

Abstract
The present paper describes the history and current status of the spread of electronic health records (EHRs)*2 and factors that facilitate or suppress their use, as well as discussing issues that relate to the further spread and future prospects of EHRs in Japan. The use of EHRs began in the latter half of the 1990s, and spread steadily because of subsidies initiated in 2002 by the Ministry of Health, Labour and Welfare. Current adoption rates are similar in clinics and hospitals, with both showing average figures of 6–7%. In terms of the scale of facilities, more than 25% of large hospitals with 400 or more beds use EHRs, whereas the corresponding percentage is much lower among hospitals with less than 100 beds, indicating that the introduction of EHRs in small-scale hospitals is challenging. The use of EHRs is beneficial in that it allows the electronic storage of medical records, sharing of data among hospital staff members, and support for treatment planning by computerized critical path. The major problem involved in EHRs is the high cost of their introduction and maintenance. Issues to be solved for the future of EHRs include cost reduction, reimbursement for costs, and specialty-specific usage. In future, EHRs are expected to play a role as a basis for cooperation in providing successful regional health care.

Key words  Electronic health records, Lifelong electronic health records, Healthcare information technology

Introduction
The use of electronic health records (EHRs), i.e., computerized clinical information, has long been a goal of healthcare information technology in Japan. Adoption of the EHR system was attempted by some pioneering hospitals in the 1990s, in recognition that the system was the next generation in hospital information technology, following the electronic order-entry system. It was not until 2000 that the EHRs became widespread. Currently, the spread of EHR technology is not necessarily rapid, but it is steadily being extended throughout medical facilities in Japan, including clinics and small-scale hospitals.

Information technology in the healthcare field has progressed rapidly on an international level in this century, and large-scale national policies for introducing healthcare information technology have been adopted in many Western countries. The main goal of advancing healthcare information technology is to construct a lifelong EHR system that would allow each person to obtain his or her healthcare information throughout life and to use the information for health management and the prevention of disease.

The introduction of EHRs provides various benefits to individual medical facilities. In addition, however, EHRs form a basis for the promotion of healthcare information technology and hospital-clinic cooperation, cooperation among various medical facilities for regional healthcare, and nationwide management of lifelong healthcare.
as mentioned above. The spread of EHRs is not only significant in the sharing of information within a medical facility, but also helps to extend healthcare information technology. In this regard, policies that provide economic incentives to accelerate the spread of the EHR system are needed. One of these is a program begun in April 2006 for the provision of additional remuneration for electronic records, which has caused slight but steady progress.

This paper, which describes the current status of EHR use in Japan, is based on the results of several surveys. In particular, factors facilitating and suppressing the spread of EHRs are discussed.

**History of EHR Use in Japan**

The status of healthcare information technology in Japan will be described briefly, with special reference to the development and dissemination of EHRs (Table 1).

(1) Prehistory: The term “electronic health records (EHRs)” was used as early as the 1980s, with the recognition that they represented the future of electronic management of healthcare information. However, the main target at that time was computerization of medical records. Until the early 1990s, EHRs generally were used on a trial basis, on isolated computers or workstations, by instructors in medical schools or clinicians in the front line.

(2) Advent of EHR systems for hospitals: The late 1990s saw an advance in healthcare information technology. First, in 1995, an EHR system development project sponsored by the Ministry of Health and Welfare was carried out, and a model EHR was proposed. Previously, in 1994, an EHR research group was organized as part of the Japan Association of Medical Informatics. Along with these changes, computerized patient records and general hospital order-entry systems were combined in medium-scale or larger hospitals, resulting in the advent of third-generation general hospital information systems utilizing EHRs. Such electronic systems were developed and applied in several pioneering hospitals. How-
ever, the majority of medium and large hospitals gave the highest priority to the adoption of computerized order-entry systems. In 1999, statistics showed that less than 20 hospitals and about 50 clinics throughout the nation were using EHR systems.

(3) Increased spread of EHRs: In response to the trend pointing toward the promotion of EHRs, the Ministry of Health and Welfare in 2000 issued a directive that permitted the storage of medical data in electronic media as long as three criteria, authenticity, visual readability, and storage property, were ensured. Under these circumstances, the Grand Design toward Computerization in the Medical Field, which specified healthcare information technology programs planned up to 2006, was issued by the Ministry of Health, Labour and Welfare in December 2001, in coordination with the e-Japan strategy of the Japanese Government. Thus, the spread of EHRs became a national policy. In addition, the 2001 supplementary budget provided for a project of Medical Networking Promotion with Advanced Information Technology by the Ministry of Economy, Trade and Industry. Following the Grand Design, the Ministry of Health, Labour and Welfare implemented a project for the improvement of medical facilities equipped with EHRs (budgetary help for 249 medical facilities) in 2002 and 2003. Thereafter, EHRs came into much more widespread use.

Even after the end of subsidies in 2003, well over 100 medical facilities adopted EHRs in 2004 and 2005, resulting in steady, but hardly explosive, progress.

**Current Status of EHR Use**

Characteristics of the current use of EHRs in Japan are described below.

**Similar rates of spread in clinics and hospitals**

The collection of 2006 statistical data from clinics and hospitals using EHRs is underway through the joint effort of the Japanese Association of Healthcare Information Systems (JAHIS) and ME Development Co., Ltd., with statistics obtained only from clinics that use EHRs. Therefore, 2005 statistics on hospitals using EHRs were used for analysis.2 As Fig. 1 shows, about 10-fold more clinics are using EHRs; however, this is proportional to the existing 10-fold difference in the absolute numbers of clinics and hospitals as a whole. Therefore, since 2002, the relative increase in the rate of adoption of EHRs has been similar in clinics and hospitals.

**Estimated rate of EHR adoption in hospitals with 400 beds or more (as of the end of 2006)**

In relation to the number of beds, the rate of EHR adoption is less than 10% among small- to medium-scale hospitals with less than 200 beds,
the predominant size category for hospitals in Japan. In contrast, among medium- to large-scale hospitals with 300 beds or more, the EHR adoption rate is more than 10% (Fig. 2), whereas the corresponding rate is about 30% among large-scale hospitals with 600 beds or more. The 2001 Grand Design set a goal of EHR adoption in more than 60% of hospitals with 400 beds or more. As of 2005, however, the rate was just 20.9% among such hospitals. Although 2006 statistics are not yet available, extrapolation of the increase from 2004 to 2005 indicates an estimated adoption rate of 25–27% for 2006. Therefore, the Grand Design seems to have achieved only about 50% of its goal.

EHR spread in relation to number of beds
Closer observation has revealed that about 70

Fig. 3 Most highly anticipated features of EHRs
(Excerpt from the report of the results of the 2004 project for demonstrating the interoperability of medical information systems, sponsored by the Ministry of Economy, Trade and Industry, 2006)

Fig. 4 Factors suppressing the spread of EHRs
(Excerpt from the report of the results of the 2004 project for demonstrating the interoperability of medical information systems, sponsored by the Ministry of Economy, Trade and Industry, 2006)

the predominant size category for hospitals in Japan. In contrast, among medium- to large-scale hospitals with 300 beds or more, the EHR adoption rate is more than 10% (Fig. 2), whereas the corresponding rate is about 30% among large-scale hospitals with 600 beds or more. The 2001 Grand Design set a goal of EHR adoption in more than 60% of hospitals with 400 beds or more. As of 2005, however, the rate was just 20.9% among such hospitals. Although 2006 statistics are not yet available, extrapolation of the increase from 2004 to 2005 indicates an estimated adoption rate of 25–27% for 2006. Therefore, the Grand Design seems to have achieved only about 50% of its goal.

EHR spread in relation to number of beds
Closer observation has revealed that about 70 hospitals each are using EHRs among medium-scale hospitals with less than 200, 300, or 400 beds. Although the percentage remains modest because the denominator is very large for hospitals of this size, EHRs are rapidly being adopted. However, both the actual number and the percentage of institutions using EHRs are very low for hospitals with less than 100 beds. It is apparent that promoting EHRs to such small hospitals is an important task for the future.

Factors Advancing and Retarding the Spread of EHRs
Although EHR use has been increasing steadily, it is clear that the goal of the Grand Design has not been reached. It is therefore important to ask what can be expected from EHRs and what...
stands in the way of their wider use. The Medical Information System Development Center carried out a survey on this issue as part of the 2004 project for demonstrating the interoperability of medical information systems sponsored by the Ministry of Economy, Trade and Industry. In this survey, questionnaires were sent to 1,379 hospitals, and responses were obtained from 374 of them. Results of the survey showed that hospitals using EHRs included those with 100–500 beds, particularly those with 300 beds. Further details of distribution not mentioned here can be accessed in the project report, but the distribution profile is much the same as that shown in Fig. 2.

The most highly anticipated features of the EHR system, as indicated by the survey (Fig. 3), include electronic storage that provides various benefits for medical practice and hospital management, sharing of information, and critical path usage. In contrast, among the drawbacks of EHRs (Fig. 4), the high cost of current EHR systems was predominant.

The cost of the EHR system does not depend simply on the size of the hospital. The cost of introducing an EHR system per bed is not constant, but increases with the size of the hospital. Clinics and small hospitals usually adopt an EHR system designed specifically for internal medicine or limited specialties with very little customization, whereas large hospitals have a number of specialties including organ-specific surgical departments. They thus require a system that is different from those designed exclusively for internal medicine. The latter hospitals tend to require costly customization, resulting in increased overall costs.

Major factors needed to accelerate the use of EHRs include cost reduction, standardization of EHR systems, and improvement of the human interface, including the input environment.

Problems in the Current Spread of EHRs

What needs to be done to promote the widespread use of EHRs? Although ease of use of the EHR system is the main factor, the following factors also are important.

Additional reimbursement for computerized medical records: an incentive to introduce the EHR system

As mentioned previously, benefits of the use of EHRs are not necessarily clear from the viewpoint of management. Hospital administrators are hesitant to introduce expensive EHR systems to their hospitals, since computerization of medical records is incurred as a necessary expenditure, similar to energy expenses. In this regard, the new item in national health insurance system, medical record computerization for reimbursement, which became effective as of April 2006, is promising. However, the amount of reimbursement seems to be too low to have any meaningful effect at this time. An adequate reimbursement incentive may be a boon to promoting the system. Therefore, substantial enhancement of the computerization incentive strategy is needed.

Cost reduction of the EHR system: toward increased introduction of standard EHRs

As indicated by the results of the aforementioned questionnaire survey, cost reduction of the EHR system is an important factor in its spread. The larger the hospital, the stronger the demand for system customization, thus increasing the cost of introduction. Although there are circumstances specific to individual hospitals, the introduction of standard EHRs should be encouraged, while discouraging excessive customization insofar as possible. Promotion, dissemination, and adoption of standard EHRs lead not only to reducing of the cost of EHR system introduction, but also to the facilitation of interinstitutional cooperation. For this purpose, it is necessary to provide incentives to hospitals that adopt the standard EHR style and are willing to share medical information among institutions in the regional community.

Dissemination of EHRs specific to specialties: reflecting practice process

The aforementioned standardization of EHRs refers to the basic structure of the EHR system. In actuality, the process of clinical practice differs among different specialties. Most current EHR systems are designed for the practice of internal medicine. Since surgical specialties are different from medical specialties in the process of diagnosis and treatment, current uniform EHR systems are unsuitable in various aspects. If variant EHR systems of the standard structure but applicable to different practice processes specific to different specialties were made available, computerization of medical records might be more acceptable to
medical professionals, resulting in more widespread use.

**Linkage of information to hospital practice: toward logistics and prevention of malpractice**

When EHR systems are used within closed wire networks, EHRs cannot play the primary role in informatization of practical hospital care. For instance, current EHR systems often do not register accurate information about the injection of a particular patient by a nurse. At present, barcodes are used for data input. The use of electronic tags that transmit ID information in the future would allow automatic identification of individual instruments and issue an alert if an error in the act of care were to occur. This means that one creates an information space that includes the interface between the information system and the surrounding practice environment, thereby achieving successful hospital logistics and prevention of malpractice. To this end, informational linkage to the surrounding practice environment by total computerization of the hospital utilizing ubiquitous communication technology is essential.

**Clinical practice-support: beyond the level of simple computerization of paper medical records**

Introduction of the EHR system will support medical professionals in improving clinical practice, for example, by facilitating integrative referral to clinical information. It is also desirable that the benefits of EHRs extend to the user clinician. Further, it is important that multiple benefits including not only clinical practice support, i.e., integrative referral to patient information, but also the following be offered to users: support for treatment planning by computerized critical path, provision of drug information (particularly information on drug interactions), various reminder features for use in individual patients, and provision of guidelines for standard clinical practice in conjunction with the Internet. The EHR systems currently available in Japan offer poor support to clinical practice, remaining at the level of simple computerization of paper medical records. Thus, development of the full capabilities of clinical practice by computerization of clinical information has not been fully realized. If the primary value of EHRs to users can be achieved, however, EHR dissemination will be accelerated.

**EHRs that Link the Institutional Milieu to the Regional Community: Toward the second generation**

As mentioned in the Introduction, industrially advanced nations in Europe and North America have simultaneously undertaken large healthcare information technology projects in order to achieve national dissemination of lifelong EHRs. Although the use of EHRs in medical facilities has not reached the required level, it remains necessary to promote interinstitutional sharing of patients’ clinical records through cooperation between hospitals and clinics as well as between hospitals; this stage refers to the second generation of EHRs. Such linkage of information with other facilities is an important basis for establishing regional healthcare information spheres, an essential step toward the realization of lifelong EHRs.

Future progress in healthcare information technology is likely to result in cooperation between medical facilities in regional healthcare, specifically to realize regional self-contained medical care by means of the critical path through cooperation with regional medical facilities, and may be integrated with lifelong health information, finally leading to a basis for the control and understanding of the health and medical care history of each individual.

**References**