Current Status of Electronic Medical Recording in Japan and Issues Involved

Masahiko Nakamura*1

Abstract
For team care to function smoothly, it is necessary for healthcare providers to have unified management and convenient sharing of medical care information and to promptly implement such information in the planning of examinations, diagnosis, and treatment. In addition, to provide patients with appropriate medical care information on the basis of informed consent, healthcare providers need to prepare medical records that are worthy of disclosure. Electronic medical recording systems can serve as a good tool to this end.

In Japan, the storage of medical records in electronic media was permitted in 1999, and 2 years later, the Grand Design toward Computerization in the Medical Field implemented by the Ministry of Health, Labor and Welfare targeted the dissemination of electronic medical records in at least 60% of clinics and at least 60% of hospitals with 400 or more beds throughout the country during the five years prior to 2006. The form of medical records and their method of storage have been left up to each medical institution provided that three criteria, namely, authenticity, visual readability, and storage property, are ensured. However, as of April 2004, electronic medical recording systems had been introduced in only 11.7% of medical institutions with 400 or more beds. The reasons for the delay in the spread of electronic recording are its high introductory costs and unknown cost-effectiveness. A governmental subsidy for the introduction of electronic medical recording that was provided during the initial two years has been abolished owing to financial constraints. Moreover, the introduction of such a recording system may impose an increased burden on doctors and other staff members in terms of data input, and consequently may adversely affect the quality of patient services by, for example, increasing waiting time.

To further disseminate electronic medical recording systems, it is desirable for each medical institution to review its current daily clinical practices and for the Government to provide some form of official support to institutions in which an electronic medical recording system has been adopted.

Key words Electronic medical records, Information sharing, Cost-effectiveness, Task burden, Official support

Introduction
The history of computerization of medical information in Japan began in 1988 with permission from the Ministry of Health and Welfare to prepare medical records by using office automation equipment. In 1994, the storage of image data such as radiographs in electronic media such as magneto-optical disks was permitted under prescribed criteria of safety, reproducibility, and common availability. The subsequent issuance on April 22, 1999, of notification concerning the storage of medical records and other data in electronic media opened the door to an era of electronic medical recording. The introduction of electronic medical recording systems was intended to 1) ensure the quality of medical care, 2) improve patient services, and 3) upgrade management efficiency. From the viewpoint of healthcare providers, the introduction of such systems was advantageous in that they allowed...
for unified management and convenient sharing of medical care information, making it possible, for instance, to view medical records inside the institution without the limitations of time and place. Moreover, prompt circulation of information among healthcare providers is indispensable for decision-making in diagnosis and treatment policies under the current model of team care. Further, it has become easier for patients to receive appropriate medical care information in the form of neat, legible medical records, time series displays, graph illustrations of test results, and printed image data. These enhancements have enhanced patient-oriented medical care, in which patients are fully informed of their situation and have input into decisions regarding the examination and treatment of their disease.

In recent years, computerization in the field of medical care has progressed rapidly in advanced Western countries such as Australia, Canada, the United Kingdom, and the United States. In the US, President Bush announced in 2004 that electronic medical records should be available for every American citizen within 10 years, and efforts have been made to develop and disseminate electronic medical recording systems as part of the project to establish a more electronically based government. In the UK and Canada, computerization projects initiated by the national government were begun in 2002, preceding the US. In the UK, standardization procedures have been promoted through a national project on medical information technology, while in Canada electronic medical recording was facilitated by an organization co-financed by the national government and the private sector, and construction of electronic medical records and enhancement of patient management have been carried out within each province. In these countries, as in Japan, the increased demands of the citizenry for better quality medical care and greater patient safety on the one hand and the need for reduced medical care costs on the other underlie these movements.

In Japan, although the introduction of electronic medical records was encouraged by the Grand Design toward Computerization in the Medical Field issued by the Ministry of Health, Labor and Welfare in 2001, the rate of introduction is still only about 10%. In Japan, it seems that more attention is being focused on improving the quality of medical records, on securing their authenticity and readability, and on storage, whereas the emphasis in other countries is on constructing networks of medical institutions. One might wonder why the introduction of electronic medical records has made such slow progress in Japan. Current problems of medical care computerization in this country are discussed in this paper, including a retrospective examination of the history of computerization.

History of medical computerization in Japan
Historically, much of Japan’s knowledge of Western medical science was introduced from Germany prior to World War II, followed by the influence of American medical science after the war. This dual ancestry resulted in some confusion in recording medical records, since for many years German, English, and Japanese medical terms all were in common usage. In addition, cipher-like descriptions or abbreviations understandable only to doctors, but not to patients or third parties, tended to be used frequently in communicating medical information. Unfortunately, conventional medical records sometimes conveyed information that was difficult to understand and largely illegible. Thus, patients developed the impression that medical records were confidential and were the possession of the physician. However, increasing public pressure to disclose medical care information and progress in patient-oriented team care resulted in greater transparency.

After the 1980s, patients’ increasing awareness of their rights led to rapid changes in the disclosure of medical care information in Japan, and it currently is widely recognized that patients have the right to access their medical records. Society now demands that information regarding medical care should be provided to the patient, and doctors are required to prepare medical records appropriate for disclosure. Because they offer clear, legible descriptions in Japanese and adopt a standardized method of description based on the principle of problem-oriented medical records (POMR), electronic medical records have become commonly used in Japan as a support for the provision of appropriate medical care information, replacing the conventional paper media.

In the current team care setting, decisions concerning treatment policy are made not only by physicians and nurses but also by various other
healthcare professionals, including pharmacists, radiological technicians, clinical laboratory technicians, physiotherapists, dietitians, and medical social workers who are employed by the medical institution. Professional information and knowledge are incorporated into medical records, which are then shared by the various healthcare providers who are part of the team. In preparing medical records, healthcare professionals should not make mere memos or personal notes, but should provide simple descriptions that are comprehensible to anyone. The introduction of electronic medical recording is expected to promote the unitary management of information and sharing of information among healthcare providers and contribute to the standardization of medical care based on the policies of clinical pathways and evidence-based medicine (EBM).

Major events during the progress of medical computerization in Japan are described below.

— May 6, 1988 —
“Methods of description for medical records, etc.” (Notification from the Health Policy Bureau, Ministry of Health and Welfare)
The use of office automation equipment, including word processors, instead of handwriting, was permitted for preparing medical records. This ensured that medical records would be clear and legible. However, the storage of records in electronic media was not authorized, and the paper printouts of medical records prepared with word processors, etc., were stored. The printouts required the signature and seal of the doctor or other staff member who prepared the medical record, to define the responsibility of the preparer. Despite the notification, most medical institutions continued to use handwritten paper records because of the slow adoption of office automation equipment and lack of experience in keyboard operation.

— March 29, 1994 —
“Storage of radiographic data, etc., in magneto-optical disks and other media” (Notification from the director of the Health Policy Bureau, Ministry of Health and Welfare)
This notification permitted the storage of radiographic data in magneto-optical disks and other electronic media so long as the requirements of safety, reproducibility, and common availability are met. Although this was the first notification to permit electronic storage, it did not disseminate to the extent that the Ministry of Health and Welfare had expected. Insufficient adoption of the notification was attributed to the fact that first priority was given to magneto-optical disks as the storage medium, and cooperation within the Ministry of Health and Welfare was inadequate.

— April 22, 1999 —
“Storage of medical records in electronic media” (Notification from the directors of three bureaus of the Ministry of Health and Welfare)
Storage of medical records in electronic media was permitted, provided that the criteria of authenticity, visual readability, and storage property were satisfied. The use of electronic medical records in place of paper medical records was permitted by this notification.

— August 8, 2001 —
“Grand Design toward Computerization in the Medical Field” (Healthcare Information System Committee)
A five-year plan for healthcare computerization was developed, and an overall design was formulated to indicate the path and promotional strategies leading to the goal.

Disclosure of medical care information
In Japan, electronic medical recording has been disseminated as an improved means of providing medical care information. In tracing back the history of disclosure of medical care information, it is apparent that movements seeking the disclosure of medical records have been in existence since the 1980s, together with movements of citizens toward wider disclosure of information contained in other formal documents. The background for such initiatives was patients’ increased awareness of their rights and their desire to make their own decisions as to examinations, procedures, and treatments after having received full disclosure as to the nature of their situation. In 1986, in a civil action in which patients sought access to their medical records, the Tokyo High Court rejected the appeal, handing down the decision that patients are not guaranteed the right to access their medical records, thereby raising the bar for disclosure of medical records. Eventually, the movements for disclosure of medical records became more strident with the lead of citizens’ groups, and the momentum for disclosure increased after the World Medical Association published in 1995 the “Declaration of Lisbon on the Rights of the
“Practice guidelines for the introduction of electronic medical recording” issued by the Japan Municipal Hospital Association defines the electronic medical recording system, as follows:

The electronic medical recording system is an information technology system for recording all data including those related to doctors’ medical care (medical records in a narrow sense). It involves medical care data including the medical care record prescribed in Article 24 of the Medical Practitioners Law, and nursing records, image findings, rehabilitation records, nutritional guidance records, and patient compliance instruction records. This is regardless of the extent of ordering and whether imaging data are processed by IT.

The above is the minimal requirement for an electronic medical recording system. The practice guidelines also cite the following conditions desirable for such a system.

1) It adopts Problem Oriented Medical Record (POMR) as a descriptive form.
2) It allows input, storage, and viewing of information on various specimens, physiological test results, and imaging data.
3) It has a close connection with the doctor’s medical care record in terms of clinical pathway.

In addition, a comprehensive discussion is now ongoing, including the development of a definition of electronic medical records by the

Patient (revised)”, which prescribed that the patient has the right to receive any information about himself/herself recorded in his/her medical records (Table 1).

During the past 10 years, various medical institutions developed their own guidelines for the disclosure of medical care information on the basis of JMA’s guidelines, and have been providing medical care information in an active manner to meet the demands of society. To prepare medical records suitable for disclosure, storage of medical records in electronic media (electronic medical records) was permitted, and the management system for medical care information was enhanced through the development of a department for the management of medical care information in each medical institution.

Although JMA accedes to the disclosure of medical records, it is against legislating disclosure, because it believes that disclosure should be a matter of the doctor’s discretion. JMA takes the view that the disclosure of medical records would be implemented by the doctors themselves, without the need of compulsory regulation.

### Definition and dissemination of electronic medical records

In general, ordering systems as well as systems for recording medical care data by doctors, nurses, and co-medical personnel are referred to as electronic medical recording systems. “Practice guidelines for the introduction of electronic medical recording” issued by the Japan Municipal Hospital Association defines the electronic medical recording system, as follows:

The electronic medical recording system is an information technology system for recording all data including those related to doctors’ medical care (medical records in a narrow sense). It involves medical care data including the medical care record prescribed in Article 24 of the Medical Practitioners Law, and nursing records, image findings, rehabilitation records, nutritional guidance records, and patient compliance instruction records. This is regardless of the extent of ordering and whether imaging data are processed by IT.

The above is the minimal requirement for an electronic medical recording system. The practice guidelines also cite the following conditions desirable for such a system.

1) It adopts Problem Oriented Medical Record (POMR) as a descriptive form.
2) It allows input, storage, and viewing of information on various specimens, physiological test results, and imaging data.
3) It has a close connection with the doctor’s medical care record in terms of clinical pathway.

In addition, a comprehensive discussion is now ongoing, including the development of a definition of electronic medical records by the

### Table 1 History of the patients’ rights movement to obtain disclosure of medical records in Japan

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 1996</td>
<td>“Citizens’ Association to Claim Disclosure of Medical Healthcare Information” was set up.</td>
</tr>
<tr>
<td>Jun. 1997</td>
<td>Notification of patients’ rights to obtain receipts for medical fees. (Ministry of Health and Welfare)</td>
</tr>
<tr>
<td>Jun. 1998</td>
<td>Report calling for legislated disclosure submitted to the Ministry of Health and Welfare. (Study Panel on Utilization of Medical Care Information Including Medical Records)</td>
</tr>
<tr>
<td>Jan. 1999</td>
<td>“Guidelines for Provision of Medical Care Information” issued. (Japan Medical Association)</td>
</tr>
<tr>
<td>Feb. 1999</td>
<td>“Guidelines for Provision of Medical Care Information in Hospitals Affiliated with National Universities” issued. (Ministry of Health and Welfare)</td>
</tr>
<tr>
<td>Apr. 1999</td>
<td>Storage of medical records in electronic media permitted. (Ministry of Health and Welfare)</td>
</tr>
<tr>
<td>Apr. 2000</td>
<td>“Guidelines for Provision of Medical Care Information in Tokyo Metropolitan Hospitals” issued. (Tokyo Metropolitan Government Bureau of Public Health)</td>
</tr>
<tr>
<td>Mar. 2001</td>
<td>Fourth revision of the Medical Service Law issued. The revised Law allowed for medical institutions to notify in their advertisements the status of disclosure of patients’ medical records and the result of evaluation of their medical practices as determined by the Japan Council for Quality Health Care.</td>
</tr>
</tbody>
</table>
Japan Association of Medical Informatics and grading of electronic medical recording systems by the Japanese Association of Healthcare Information Systems Industry (JAHIS).

In 2001, 2 years after official permission was obtained for electronic medical recording, the “Grand Design toward Computerization in the Medical Field” was issued by the Healthcare Information System Committee in order to facilitate the dissemination of electronic medical records (Table 2).

The Ministry of Health, Labor and Welfare has supported the introduction of the electronic medical recording system through a subsidy system since 2002, as a means of promoting the introduction of such a system. However, after 2 years of implementation, the subsidy was discontinued in 2005 because of the Government’s financial situation. Withdrawal of the subsidy inhibited the spread of the electronic medical recording system, with some medical institutions postponing introduction of the system. Thus, there has been little progress in the introduction of the electronic medical recording system in medical institutions. The rate of introduction in medical institutions with 400 beds or more was 11.7% as of April 2004, according to the final report from the Standard Medical Record Promotion Committee, a private advisory panel to the Director of the Health Policy Bureau, Ministry of Health, Labor and Welfare. In addition, the rate of introduction in clinics is also low, less than 10%. On the other hand, receipt computers, which are used in nearly 80% of medical institutions, represent an indispensable tool for them. The cost of introducing the electronic medical recording system remains high. The cost of introducing the system is reported to be 1–1.5 million yen (8,700–13,000 USD) per bed, and the total project cost 5 years after introduction may correspond to 2.5–5% of medical practice income, a heavy burden for a medical institution.

Three criteria for electronic medical record use
When electronic medical records are employed, the form of the medical record and the method of storage are left to the hospital’s discretion as long as the three criteria—authenticity, visual readability, and storage property—are met. An extract from the Electronic Medical Record Guidelines is presented below.

1. Securing authenticity

Authenticity of an electronic medical record means that responsibility for preparation of the record is obvious to a third person, and that intentional or negligent input of false data and alteration, deletion, or confusion of data are prevented.

(1) Clarification of where responsibility lies

To define the locus of responsibility, it is necessary to prevent input by persons pretending to be the person responsible and to preclude any confusion of responsibility occurring as a result of subsequent addition, alteration, or deletion of the recorded data. The following measures are necessary to clarify the locus of responsibility for making electronic medical records.

1) Identification and authentication of the person responsible for making the electronic medical record

The person responsible for making the electronic medical record should be identified and authenticated (through ID, password, etc.), to prevent falsification by someone pretending to be the person responsible.

2) Finalization of the procedure

If a clerk, nurse, or other personnel inputs data instead of the person responsible for creating the electronic medical record, the

<table>
<thead>
<tr>
<th>Table 2 Grand Design Toward Computerization in the Medical Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Introduction of the electronic medical recording system</td>
</tr>
<tr>
<td>In ≥60% of clinics in the country, and ≥60% of hospitals with ≥400 beds (by 2006)</td>
</tr>
<tr>
<td>(2) Introduction of the electronic processing system for the diagnosis and treatment of patients for medical fee receipts</td>
</tr>
<tr>
<td>≥50% of hospital receipts throughout the country (by 2004)</td>
</tr>
<tr>
<td>≥70% of hospital receipts throughout the country (by 2006)</td>
</tr>
</tbody>
</table>

(Healthcare Information System Committee, August 8, 2001)
person responsible (doctor) should ascertain the data that has been input. In addition, the record should pass through a “finalizing” procedure to clarify responsibility for the addition, alteration, or deletion of the finalized record.

3) Recording of identification
When finalizing the record, identification of the person responsible for making the electronic medical record should be recorded.

4) Preservation of updated information
After the medical record has been finalized, any updating should be preserved to permit confirmation of the subsequent addition, alteration, or deletion.

(2) Prevention of false input, alteration, deletion, and confusing items
Incorrect input, alteration, deletion, or confusing items can be caused by negligence that occurs as a result of simple inputting errors, misunderstandings, or mix-up of data. It is useful to prescribe in the operating instructions that the contents be fully confirmed before the finalization procedure. False input, alteration, or deletion by someone pretending to be the responsible person should be prevented by identifying and authenticating the person to whom responsibility has been designated. Intentional false input and falsification are of course against the law.

In Japan, identification and authentication of the operator is generally done through the use of an ID or password, with the latter changed on a regular basis. In addition, biometrics technology with higher security, such as fingerprint verification, has been introduced recently. In general the record is designed to be unalterable after a certain period of time has elapsed, and any history of modification is to be stored with the original record if the original record is modified. It is common for doctors themselves to input orders for prescriptions, tests, and procedures, to avoid mistakes by clerks. However, an increasing number of medical institutions permit clerks to input written data from doctors in order to reduce the burden of data input on doctors. As of now, transcriptionists and real-time reporters are rarely used in medical institutions. In any case, to ensure the authenticity of electronic medical records, the responsible doctor is required to confirm the data input by the clerk. Most electronic medical recording systems currently available in Japan include this function.

2. Securing visual readability
Visual readability means that the data stored in electronic media are easy to read with the naked eye and can be printed on paper if necessary. It often is necessary to respond promptly to claims of disclosure from the patient or orders of submission for audit by the public health center, for lawsuits, and so on. The following measures are necessary to secure visual readability.

(1) Managing the location of information
If data are stored in various types of media, such as electronic and paper media, management of their location should be ensured.

(2) Managing the means to create visually readable data
The equipment, software, and relevant information necessary for visual reading of stored data should be available.

(3) Management of classified information
Information should be classified according to finalization status, extent of use, history of updating, degree of secrecy, etc., and access rights and other rights should be managed according to the class of information.

(4) System operation management
The operating procedure should be defined so as to guarantee safe and appropriate use of the system.

(5) User management
To control the allocation of access to the system, the procedure for user management should be clearly defined.

3. Securing storage property
Storage property refers to the storage of data under conditions such that the data can be restored at any time while maintaining their authenticity and visual readability during a given legally designated period. It is necessary to execute the following measures to secure storage property.

(1) Measures against deterioration of medium
The data should be copied to a new recording medium before the initial medium deteriorates.

(2) Management of software, equipment, and medium
Security measures should be taken to prevent the destruction and falsification of data by improper software, including computer viruses.
(3) Securing continuity
If the system is to be changed, data migration and other measures should be performed to ensure continuous use of the data accumulated by the former system.

(4) Information protection function
An information protection function should be incorporated to prevent intentional or negligent destruction of data. A data restoration function should also be installed in the event that such destruction has occurred.

Securing visual readability and storage are closely correlated, and the system must be able to operate for an extended period. In Japan, medical records are required by law to be kept for five years. Criminal responsibility for malpractice also extends for five years. Therefore, the statute of limitation runs out when the legal storage period has expired. On the other hand, the statute of limitations for civil affairs is 10 years in cases of default of obligation, and, in cases of illegal acts, the statute of limitations is 20 years after the illegal act has occurred. Because of this, a five-year period actually is not adequate for the storage of medical records, and it is generally specified in medical institutions that medical records should be kept for 20 years, until the statute of limitations for civil affairs liability runs out or for an indefinite period. Therefore, although the recording medium of an electronic medical recording system is not designated by law, many medical institutions adopt a high-capacity server.

In addition, as points to keep in mind for system operation, it is recommended that operation and management rules suitable for each medical institution be developed and followed, that data compatibility among different systems be secured to promote efficient, mutual use of data, and that measures to protect privacy be taken.

Packaging and standardization of the system
When an electronic medical recording system is incorporated in a medical institution, the system may be developed from scratch according to the demand specifications of the institution, or packaged system software provided by a vendor may be purchased. In the case of the former, development of the system requires huge expenditures and a prolonged period of time, among other problems. In addition, staff members working in the medical care setting rarely have a clear understanding of system development, and it is difficult to standardize systems if systems addressing various different requirements are developed. The market for electronic medical recording systems is expanding rapidly in Japan, and more than 10 major firms have entered the market. The quality of software applications provided by these vendors is high, and most of them are standardized in regard to basic requirements. When introducing an electronic medical recording system, most medical institutions tend to purchase a software package and customize it if necessary.

The form of medical records and the method of their storage are left to each medical institution under its own responsibility, so long as the three criteria are satisfied: authenticity, visual readability, and storage property. However, if each medical institution were to adopt an arbitrary system, it would be difficult for institutions to share data, and secondary use of the data for constructing a database of medical care information could be difficult. In this connection, a foundation, the Medical Information System Development Center (MEDIS), has developed a nationwide uniform terminology and coding schema under commission from the Ministry of Health, Labor and Welfare, to promote the standardization of electronic medical records. The following items have been standardized up to now.

(1) Terms and examinations/procedures
   1) Diagnoses
   2) Operations and procedures
   3) Clinical laboratory tests
   4) Medications
   5) Medical materials
   The above five items are coded, with diagnoses are specified according to ICD-10 (International Statistical Classification of Diseases and Related Health Problems—10th Revision) and operations and procedures according to ICD-9-CM (International Statistical Classification of Diseases and Related Health Problems—9th-Clinical Modification).

(2) Standardization of information exchange standard
To ensure interchangeability in information exchange, the use of products that have the following specifications as standard features is encouraged.
1) HL7 Ver. 2.4 or later, and HL7 Ver. 3 (XML form)
2) DICOM standard
In addition, standardization (coding) of terms used for recording data from “interviews and findings” is now under consideration.

Cost-effectiveness
One of the reasons for the relative lack of progress in the spread of electronic medical recording systems is their high introductory cost coupled with uncertain economic results. Our hospital, a small hospital with 215 beds, has been working on the systematization of medical information since 1991. The systems so far introduced in our hospital are as follows:
1) Medical practice support system (medical records);
2) Ordering system;
3) Clinical pathway system;
4) Nursing support system;
5) Medical accounting system;
6) Radiation information system (RIS);
7) Image and information management system (PACS);
8) Dispensing support system;
9) Pharmaceutical management and guidance system;
10) Drug information system;
11) TDM system;
12) Clinical examination system;
13) Microbiological examination system;
14) Pathological examination system;
15) Nutritional management system;
16) Thorough health screening system;
17) Referral patient management system;
18) Clinical history management system;
19) Long-term medical care database management system.

Our hospital adopted a system package, and the total project cost was about 320 million yen (2.8 million USD), including the subsidy. The cost of introduction was 1.5 million yen (13,000 USD) per bed. Assuming that the system is used for five years, the per-bed, per-day cost of introduction for each inpatient is:

$$\frac{1,500,000 \text{ yen} (13,000 \text{ USD})}{365 \text{ days} \times 5 \text{ years}} = 822 \text{ yen} (7.1 \text{ USD}).$$

This means that the hospital incurs a burden of about 800 yen (7 USD) per bed per day (patient service) because of the introduction of the electronic medical recording system. Whether the revenue obtained is worth this cost is an issue. In this regard, the Standard Medical Record Promotion Committee reports that an increase of 600 million yen (5.2 million USD) in annual revenue is expected for a model hospital with 500 beds, 1,200 outpatients per day, outpatient revenue per capita of 8,000 yen (70 USD), and inpatient revenue per capita of 40,000 yen (350 USD) (Table 3).

According to my analysis of the above report, the cost of introducing and maintaining the sys-
The value obtained by subtracting 7) from the sum of 1)–6) (−6.5%; about 600 million yen (5.2 million USD)) is the revenue increase by adopting the electronic medical recording system.
were making an effort to secure the quality of medical care and to improve patient services, although their workload was increased.

Introducing an electronic medical recording system in a hospital often places an increased burden on personnel, and causes stress particularly for those who are unfamiliar with computer operations. Since data input should be carried out at the point of origin, the doctors’ workload inevitably is increased to a great extent. One harmful effect is that the increased workload of doctors and other staff members results in longer waiting times for patients. This is not only because doctors are inexperienced and unfamiliar with input operations, but also because the electronic medical recording system has enabled “appropriate medical practice,” which takes into account patient safety management and informed consent. Improved quality of medical practice has extended the amount of time for the doctor to see the patient. To address the prolonged waiting time, operational reform, such as more efficient use of time by conducting preliminary examinations in an interview center and the use

In comparison with pre-introduction, workload is:

![Workload Chart]

(By occupational category)

<table>
<thead>
<tr>
<th></th>
<th>Markedly increased</th>
<th>Markedly decreased</th>
<th>Decreased</th>
<th>Decreased markedly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Staff</td>
<td>6%</td>
<td>1%</td>
<td>12%</td>
<td>34%</td>
</tr>
<tr>
<td>Markedly increased</td>
<td>6%</td>
<td>1%</td>
<td>12%</td>
<td>34%</td>
</tr>
<tr>
<td>Decreased</td>
<td>12%</td>
<td>1%</td>
<td>12%</td>
<td>34%</td>
</tr>
<tr>
<td>Increased</td>
<td>34%</td>
<td>17%</td>
<td>28%</td>
<td>42%</td>
</tr>
</tbody>
</table>

Fig. 1 Changes in workload among the staff

Table 6 Loans to support upgrading of medical institutions (in 2002)

<table>
<thead>
<tr>
<th>Loan project</th>
<th>No. of sites</th>
<th>Programmed government subsidy (×1,000 yen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility improvement for introducing the electronic medical recording system</td>
<td>108</td>
<td>12,464,271 (108 million USD)</td>
</tr>
<tr>
<td>Facility improvement for modernizing the medical institution</td>
<td>20</td>
<td>1,336,926 (11.6 million USD)</td>
</tr>
<tr>
<td>Environmental improvement for intern doctors in clinical training hospitals</td>
<td>1</td>
<td>1,961 (17,000 USD)</td>
</tr>
<tr>
<td>Environmental improvement for clinical training facilities for dentists</td>
<td>3</td>
<td>78,011 (678,000 USD)</td>
</tr>
<tr>
<td>Environmental improvement for education in dental hygienists training schools</td>
<td>1</td>
<td>7,381 (64,000 USD)</td>
</tr>
<tr>
<td>Environmental improvement for nursing staff training</td>
<td>19</td>
<td>41,625 (362,000 USD)</td>
</tr>
<tr>
<td>Total</td>
<td>152</td>
<td>13,930,175 (121 million USD)</td>
</tr>
</tbody>
</table>
of an Internet reservation system, may be helpful. The simple introduction of an electronic medical recording system can cause deterioration in patient services, depending on the type of work.

**Governmental support measures**

The Ministry of Health, Labor and Welfare gave support to the introduction of electronic medical recording systems by publishing the Grand Design in 2001 and providing grants-in-aid to medical institutions in 2002 and 2003. The grant was set at half the total project cost, and was paid up to an upper limit of 100 million yen (870,000 USD) when the total project cost exceeded 200 million yen (1,740,000 USD). The actual results of implementation in 2002 were Table 6.

Electronic medical recording systems were introduced in 108 medical institutions in 2002, and as many as 90% of the loans to support upgrading medical institutions were used to introduce electronic medical records. The Grand Design set a goal of introducing electronic medical recording systems in at least 60% of hospitals with 400 or more beds, a total of about 500 hospitals, over five years. About 100 hospitals per year were expected to receive the grants-in-aid. However, the subsidy was discontinued in 2004 because of financial difficulties. Therefore, some institutions considering the introduction of the system in expectation of the subsidy postponed it, causing further delay in dissemination of the system. After 2004, support projects limited to promotion of the development of local networks of medical institutions already equipped with electronic medical recording systems have been carried out. Unfortunately, resumption of the discontinued subsidy is unlikely.

**Conclusion**

There is no doubt that electronic medical records are indispensable for providing appropriate medical information and high-quality medical care that includes patient safety. However, one of the reasons for the delayed dissemination of electronic medical recording systems is the potential increase in workload for doctors and other staff members following introduction of the system. The development of new input devices, such as pen tablets and voice input, which can replace conventional keyboard input, would reduce the burden on doctors. It is also necessary to consider the use of medical secretaries who are engaged in real-time reporting or transcription from voice recorders, instead of direct input by doctors. The simple introduction of an electronic medical recording system can result in deteriorated patient services, such as increases in waiting time, depending on the type of service involved. Thus, successful introduction of the system requires a review of medical care services as a whole.

Medical institutions in Japan commonly adopt packaged systems. Even in such cases, the cost of introduction is 1–1.5 million yen (8,700–13,000 USD) per bed. It is questionable whether these high introduction and maintenance costs should be borne by medical institutions alone. It is desirable that official support from the Government be available to medical institutions where the electronic medical recording system has been introduced.

**References**