Development of the electronic health record in Japan

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Abstract

In Japan, the order entry system has been employed in almost all university hospitals and popularisation of this system has also started in medium-sized hospitals. However, there has been a tendency in general hospitals in Japan to consider the electronic chart system where there has been no order entry system. Moreover, in small-scale clinics, there is no benefit in using the order entry system. Young doctors in Japan are beginning to employ the electronic chart system directly for the first time, without experience with the order entry system. In this paper, the development of the hospital information system in Japan and that of the electronic health record system are described. © 1998 Elsevier Science Ireland Ltd. All rights reserved.

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1. Introduction

The health insurance system has been established to guarantee public health in Japan and Japan fortunately became the country with the longest life expectancy in the world. However, it has been forecasted that the ever-growing medical expenses will upset the health insurance system. In this paper, the status quo of medical information systems is outlined and the work on the ‘electronic health record’ which will also be the key to the rationalisation of the medical system in the near future is described.

2. Status quo of the hospital information system

It is not possible to talk about the history of the medical information system in Japan without referring to the medical accounting system. Two or more insurance systems, the national insurance and social insurance and complex remuneration systems, have existed in the background of the insurance system. The hospital should carry out the insurance claim handling every month. To rationalise this complex claims procedure, computerisation of the medical claims business was born.
This has already had a history of 15 years or more. Next, the order entry system was born. This was introduced to serve the patient, especially to minimise the waiting time in the accounting and registration departments. Information which relates to the accounting of the encounter and the prescription, etc. is input at the diagnosis and treatment site and overall processing time is shortened. This system has as aim to rationalise the work load and to smooth the ‘bottleneck’ which was concentrated on the medical business section by moving it to the clinical department. As a result, the waiting time was dramatically shortened to their benefit. Moreover, information on the prescription etc. is accurately transmitted because computer processing is done and the number of wrong prescriptions etc. has also decreased. However, there are two contrasting facets in this system; to record the complaints of the patient on paper or to enter them into computer system are two different things. Paper and computers represent two different media, requiring different efforts to carry out the interpretation.

3. Electronic health record project

3.1. Introduction

This friction between computer and paper could be avoided by recording all information into the computer system. The demand for the realisation of the so-called electronic health record system has grown with the development of recent computers. This project has been promoted by the Ministry of Health and Welfare and the Japanese Medical Information Science Association for the past three years with considerable progress [1–3].

It is summarised as follows:

- standardisation of medical terms;
- security; and
- standardisation of clinical treatment processes.

Our information exchange technology is described below.

3.2. Development of exchange technology of medical information

Vendors which have already been offering order entry systems will certainly put new products on the market in the electronic health record age in Japan. Then, to achieve the medical information exchange, we have developed the following according to our own policies.

1. The degree of freedom in each system is kept to its maximum.
2. At the exchange of medical information between systems or subsystems, the data are converted into a standard format and vice versa (Fig. 1).

The standard format is MML (medical mark-up language), which we enacted. Regarding MML, detailed information on version 1.0 was published in May, 1997 [4]. The characteristics are as follows:

(1) MML has been developed as the data description language in order to exchange the diagnosis and treatment data between medical facilities. This can be used by the hospital, the patient and the inspection centre and between hospitals where electronic exchanges of data are expected.

(2) MML is the data description language used when a certain facility transmits diagnosis and treatment data to another facility. The data within a facility are expressed and recorded by any form of their own. Therefore, when the data are exchanged, conversion into the MML form or the inverse is performed from the local form of the expression.

(3) MML is the data description language limited to the 7th layer of the OSI model.
Fig. 1. Operation concept of MML. The vendors are permitted to make an electronic health record system (EHR) based on their original design concept. Therefore, the design of the database of the EHRs will be different. Each system is equipped with the MML interface. When the medical information is sent to the outside, the interface performs MML encoding and transmits the medical information as an MML document. The inverse situation and the interface carry out MML decoding and store information in their database. Each system only has to be equipped with one MML interface.

(4) MML is a description language in accordance with SGML [5] and as a result, the described clinical data become one SGML instance (Fig. 2).

MML is DTD (document type definition) specialised in the description of clinical information (Fig. 3). By the exchange of clinical

Fig. 2. An example of SGML instance (MML document). The medical information in MML format is expressed as a character string enclosed by tags. The tag used here shows a medical concept. The receiving opponent analyses this and receives medical information correctly.
information as an SGML document, it is possible to surmount the differences of systems. Refer to the original paper for the details of the structure.

3.3. Unification of medical terms

MML is a gradual classification of clinical records from a global concept into a detailed concept. Finally, it arrives at the level of the term when the classification comes to an end. When in MML, the terms which actually are recorded and used are not provided for, we must make a decision: to use defined terms or use free terms. We will choose, case by case, the decision depends on the user’s preference.

However, the unification of terms is indispensable when producing statistics, for instance on a nation-wide scale. The standardisation work concerning the name of disease is chiefly done by the group which takes charge of the unification of the medical terms now. They base their work on SNOMED, ICD-10, the work of translating ICH into Japanese and the similar word dictionary. Refer to Satomura’s paper [6] for details of this project.

3.4. Security

We think that the guidelines concerning security have been completed. ‘Fire-wall’ is used concerning the system security. Encryption is used for the communication and the multi step floor authorisation system is adopted for individual authorisation. Refer to Yamamoto’s thesis [7,8].

MML is an expression of a logical structure of the clinical record by using the SGML technology. MML is a rule to express the content of the clinical record with SGML.

3.5. Standardisation of diagnosis and treatment processes

The purpose of standardisation of diagnosis

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Fig. 3. DTD which expresses MML. We analysed an actual clinical record and have extracted the included medical concept. A logical structure of the clinical record was decided according to this information.
and treatment processes is to make the level or the quality of the diagnosis and treatment of various facilities equal or as equal as possible. This research group has proposed the use of the care map system [9]. This is a method of presenting the clinical processes in a table of two dimensions. The presented items such as prescriptions, treatments and operations are mapped synchronously with the order entry system and efficient clinical planning and assessment are possible. This is a very convenient clinical tool expressing in the table the whole picture of the patient treatment. This was born out in our experiences with the order entry system which has been cultivated up to now.

4. Problems which should be solved

4.1. Exchange technology of medical information and standardisation of medical terms

The rules for the exchange technology of the medical information are already in place. However, it is expected that various omissions or bugs will occur at the stage when we start to use this technology in the medical information system.

Questions as to how to describe special conditions in ophthalmology have been openly posed. Tags of various stages may be needed in order for the input assistance and various terms have already been submitted. Should the tag be added to the MML or used as an external expression? These questions have also been submitted.

It is important that the MML system be used in any electronic chart system, especially in small systems employed by medical practitioners. This is indispensable for the healthy development of electronic chart systems.

4.2. Security

The problems concerning the safety of LAN, problems of tapping and individual authorisation have been solved already. However, it remains a problem to what extent the user is allowed to access diagnosis and treatment information. This is a big problem because various ideas exist about the access right which cannot be indiscriminately provided. Because this is a certain kind of social problem, I do not think the decision is simple. Social agreement may be necessary. This problem should be discussed not only by experts but also by patients and lawyers.

4.3. Standardisation of diagnosis and treatment processes

It is my assumption that the formulation of clinical processes, i.e. the procedures of clinical diagnosis and treatment according to disease will be a difficult and delicate task, but is not impossible because there are a lot of experts in the world. Typical clinical processes will be collected into the library. A public library in the standard format may be needed for the exchange of information concerning diagnosis and treatment procedures.

5. Conclusion

The status quo and the problems of the electronic clinical record system in Japan have been described. The Japanese medical situation has been deteriorating just as in the United States. Bankruptcy or failure of the insurance system is approaching and various measures are being taken in order to prevent the ‘big bang’. However, it will be embarrassing not to maintain the high standards of medicine now in use in Japan. To solve this conflicting question, the best use of computers has to be foreseen.
References


