



Database for Patient Information Management in Radiation Oncology Department

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The purpose of this study is to build a database of patient information for efficient radiotherapy management. Microsoft Office Access was used to build the database owing to its convenience and compatibility. The most important aspect when building the patient database is to make the input and management of patient information efficient at every step of radiotherapy process. The information input starts from the patient's first visit to the radiation therapy department and ends upon completion of the radiotherapy. The forms for each step of radiotherapy process include the patient information form, the radiotherapy schedule form, the radiotherapy information form, the simulation order form, and the patient history form. Every form is centrally connected to the radiation oncology department's patient information form. A test revealed that the database was found to be efficient in managing patient information at each step. An important benefit of this database is improved efficiency in radiotherapy management. Information on patients who received radiotherapy is stored in a database. This means that this clinical data can be found easily and used in future, which will be helpful in research studies on the radiation oncology department. Benefits such as these will potentially contribute to improved radiotherapy quality.

Keywords: Database, Radiation therapy, Patient information

Introduction

The electronic patient information management system has become more critical as the radiation therapy technique more complex and the number of case larger. Efficiency of radiation therapy will increase if radiation therapy process is managed efficiently.^{1,2)} In addition, it can contribute to radiation therapy studies and tasks.^{3,4)} During the past two decades, the effect of an electronic patient management system have been studied continuously.⁵⁻⁸⁾

Han et al.⁹⁾ reported that the work load for nursing/ clerical staff, simulation staff and technologist staff were reduced by 85.7%, 61.2% and 20.6%, respectively by using

the electronic chart.

We believe that the database of patient care for radiation oncology helps to improve the quality of radiotherapy by greatly increasing the efficiency of the radiation oncology department if it well organized according to the radiotherapy flow.

The purpose of this study is to establish a database of patients under radiation therapy stages for efficient computerization of radiation therapy, and to verify that the database is operated in the development direction.

Materials and Methods

1. Database development tool

Microsoft Office Access has been used to build the patient management database. Access is a useful tool to build, operate, and manage databases easily. The advantage of this tool is anyone can deploy and manage databases even he/she is not an expert in database. These advantages will stand out when we need to modify or complement the database, already established.

2. Establishment of patient care database

1) Considerations for establish databases

The most important consideration for establishing the database for patient care is to enable and manage patient information. For efficient patient care, this is considered the most important aspect of the database establishment because it is considered optimal for managing patients with radiation therapy levels.³⁾

2) Radiotherapy process analysis

Because it is necessary to enter the appropriate data in the patient care database for each treatment procedure to ensure effective patient care, it is necessary to explore the

process of radiotherapy prior to initiating the establishment of a radiation treatment patient database. First, when a patient visits the nursing department, they enter the basic information on the patient in the chart. Then the doctor examine the patient and select how patients for treatment. After the patient's examination, radiotherapists prepare the simulation. At this stage, a plan for radiation therapy is created by the medical physicist and the plan is confirmed. After the simulation, the patient begins to receive radiation therapy.

3) Basic structure of the patient management database

Configured Access tables according to radiation therapy flow. The patient information table stores the most basic patient information. After the treatment begins, the patient's treatment information is stored in the patient care information table. Several patient care information data can be connected to one patient information data, because the patient can receive multiple treatments. The Simulation Order table stores the necessary information for the simulation and is linked to patient care information data. The patient care history table is also stored in the patient's treatment history data, such as the radiation therapy that the patient receives, and this table is also linked to patient care information. A patient booking record table is a table where can store patient reservations information.

Fig. 1. Program main form for patient information input.

4) Patient treatment information input form

If the table in the Access is a warehouse then the form is a tool for managing goods. Therefore, the effectiveness of the data input depends on how well the form is structured. Since the radiotherapy data should be entered by each department for each treatment process, the form was made according to the radiation treatment process flow. Also, the convenience forms were made to increase the management of patient care. Fig. 1 shows the first screen of a form that manages a patient in radiological oncology department. It is designed to manage the patient according to the treatment process starting from the form in which

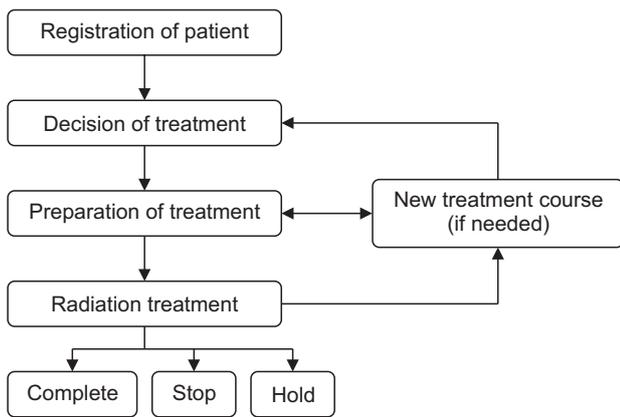


Fig. 2. Diagram of radiation treatment process for database program.

new patient information can be input.

Results and Discussion

Radiotherapy patient management database was established to the flow of radiotherapy. Fig. 2 shows the algorithm used in the patient management database.

The management form has a tab corresponding to each radiation therapy step, and the patient's information appears on the tab in response to the treatment step of the current patient. Database users can use this control form to input and modify patient's data in accordance with the patient's care flow. The effectiveness of this system can be evaluated quantitatively as duration for each process. The average duration was reduced by approximately 20% or more comparing to the conventional paper system.

1. Patient management form

When patient registration is completed on the screen of Fig. 1, the entered patient information appears in the list of simulation order tab. This tab shows you to prepare your patient for simulated treatment based on the information entered by your doctor. Fig. 3 shows a form for managing the patient's mental treatment arrangements.

When the simulation prepared, the treatment schedule

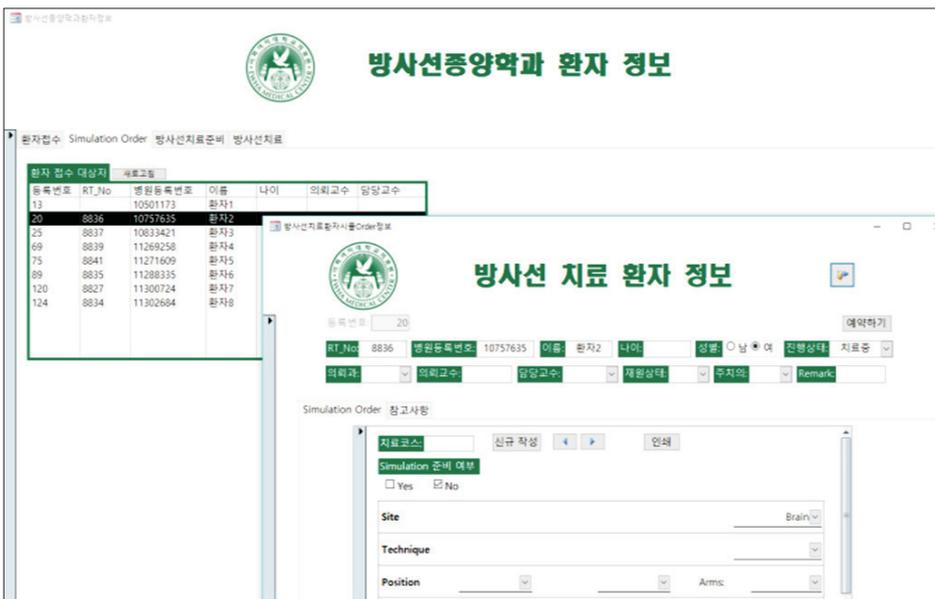


Fig. 3. Simulation order and manage form.

is confirmed. The patient information is transferred to a list of the radiotherapy preparation tabs. In this tab, the data of the patient's simulation treatment completion and radiotherapy preparation stage are stored and managed. It also has the ability to organize the entire list of people who are preparing for simulation and radiotherapy to export the list to Excel. Fig. 3 shows a form showing information about the simulation and Fig. 4 is a screen of form showing the patient's treatment plan information.

When the patient's simulation done and the treatment prepared, the patient is ready for radiotherapy. Patients for

radiotherapy is transferred to the radiation therapy tab. We can manage the patients undergoing radiation therapy in the radiation therapy tab. Fig. 5 shows the composition of the radiotherapy tab.

The Radiotherapy tab consists of a list of patients scheduled to be treated, a list of rest subjects, and a list of patients undergoing treatment. The list of patients to be treated shows a list of patients who have completed their radiotherapy preparations and have not yet started treatment. The list of Rest subjects shows the list of patients who have been in rest therapy during radiotherapy. The



Fig. 4. Patient treatment plan management form.



Fig. 5. Treatment record form.

Fig. 6. Statistics information form of treatment.

Patient of undergoing treatment List Search function can search for patients currently under radiotherapy, subject to name, hospital registration number, and treatment room. If you click on the subject after searching, a simple treatment history is displayed in the right treatment history field. Also if you double click on the target, you will see a form displaying detailed treatment information for the patient. In this form, we can see the patient's ongoing radiation therapy information. It informs the number of radiotherapy to be based on the information set in the treatment planning stage. Also the cumulative dose currently treated and the number of remaining treatments can be informed through the cumulative number of radiation treatments. The types of treatment ending include the completion of treatment normally completed, the resting of treatment that stop treatment and take a break and the treatment interruption that the patient died during treatment or fails to complete treatment normally due to his or her will. When the corresponding box checked, the patients list does not appear in the ongoing treatment.

2. Convenience form

Fig. 6 shows the statistical information during treatment. It shows the treatment plan statistical information including the simulation and DQA, and the statistical information of the radiotherapy based on the treatment room and the treatment date.

Conclusion

As a result of the test, the database for patient management in radiation oncology worked well according to the radiotherapy flow. It means that patient data can be efficiently managed from the reception of the patient to the process of receiving the radiation treatment through the process of consulting the patient and planning the treatment.

Since it is easy and convenient to input and output patient data at each step, it is expected that it will be very helpful for the stepwise patient management. It is expected that the efficiency of the department of radiation oncology will increase because it can input and output the necessary data in the database in accordance with the condition, rather than retrieving necessary data from many data for patient management. In addition to the advantages of efficiency of radiation treatment, information of patients treated with radiotherapy is recorded in the database, so that the necessary clinical data can be found easily and quickly.

However the average workload was greatly reduced from the study of Han et al.,⁹⁾ the workload for physicist was increased by 28.4% on the contrary. In this study the workload for physicist was not evaluated separately. Further study need to take account into the physicist workload, since the only one physicist rolls physicist, dosimetrist and specialist simultaneously in many mid-sized hospitals in Korea. We need to consider how to reduce their workload effectively using the electronic patient management systems. These efforts will contribute to improving the quality of radiation therapy.

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Conflicts of Interest

The authors have nothing to disclose.

Availability of Data and Materials

All relevant data are within the paper and its Supporting Information files.

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