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Development of new on-line statistical program for the Korean Society for Radiation Oncology

Si Yeol Song, MD, PhD[1], Seung Do Ahn, MD, PhD[1], Weon Kuu Chung, MD, PhD[2],
Kyung Hwan Shin, MD, PhD[3], Eun Kyung Choi, MD, PhD[1], Kwan Ho Cho, MD, PhD[4]

[1]Department of Radiation Oncology, Asan Medical Center, University of Ulsan College of Medicine, Seoul; [2]Department
of Radiation Oncology, Kyung Hee University Hospital at Kangdong, Kyung Hee University School of Medicine, Seoul;
[3]Department of Radiation Oncology, Seoul National University Hospital, Seoul National University College of Medicine, Seoul;
[4]Department of Radiation Oncology, Proton Therapy Center, National Cancer Center Hospital, Goyang, Korea

Purpose: To develop new on-line statistical program for the Korean Society for Radiation Oncology (KOSRO) to collect and extract medical data in radiation oncology more efficiently.

Materials and Methods: The statistical program is a web-based program. The directory was placed in a sub-folder of the homepage of KOSRO and its web address is http://www.kosro.or.kr/asda. The operating systems server is Linux and the webserver is the Apache HTTP server. For database (DB) server, MySQL is adopted and dedicated scripting language is the PHP. Each ID and password are controlled independently and all screen pages for data input or analysis are made to be friendly to users. Scroll-down menu is actively used for the convenience of user and the consistence of data analysis.

Results: Year of data is one of top categories and main topics include human resource, equipment, clinical statistics, specialized treatment and research achievement. Each topic or category has several subcategorized topics. Real-time on-line report of analysis is produced immediately after entering each data and the administrator is able to monitor status of data input of each hospital. Backup of data as spread sheets can be accessed by the administrator and be used for academic works by any members of the KOSRO.

Conclusion: The new on-line statistical program was developed to collect data from nationwide departments of radiation oncology. Intuitive screen and consistent input structure are expected to promote entering data of member hospitals and annual statistics should be a cornerstone of advance in radiation oncology.

Keywords: Statistics, On-line, Program, Database, Radiation oncology, KOSRO

Introduction

Statistics in medical science is important to ensure its quality of clinical practice and research because well-organized database is the cornerstone of medical advance. In the field of radiation oncology, nationwide statistical database is also so important to handle and analyze number of installed radiation facilities, dedicated persons with any risk of radiation hazard or treated patients [1-3]. For the last two decades, the Korean Society for Radiation Oncology (KOSRO) has been developing in its volume, persons and quality and trying to develop well-designed nationwide statistics [4]. In 2001, KOSRO developed

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the first on-line statistic program and operated to collect data to analyze status of department of radiation oncology after then [5]. However, the environment in Internet was changed for a decade after launching of the 1st program, we have a necessity to develop the new system that is more efficient and user-friendly, and contain newly-updated contents.

We developed a new on-line statistical program to establish a unified and updated database system for collecting efficiently nationwide medical data of radiation oncology in the KOSRO.

Materials and Methods

This statistical system was developed by cooperative works with M2Comm Co. Ltd. (Seoul, Korea). We designed whole structure of this system and the company realized a Web-based program for the input and analysis.

1. System configuration
The statistical program is totally a Web-based program and merged into homepage of the KOSRO, http://www.kosro.or.kr. The directory of statistical input and analysis was placed to sub-folder of homepage of the KOSRO and its address is http://www.kosro.or.kr/asda. ASDA is abbreviation of the annual statistical data analysis. User can access to the statistical program by two ways: by clicking a link button of 'Annual Statistics' in homepage of the KOSRO or directly by typing designated address http://www.kosro.or.kr/asda. The operating of system server is the Linux and webserver software is the Apache HTTP server. The MySQL, most widely used open-source related database management system (RDBMS), is adopted for DB server and the PHP, a language for server-side scripting

or web development, was dedicated to develop this online statistical program (Fig. 1).

2. Login and operation
Each hospital and board member of KOSRO was independently given login ID and password to secure any information of each worker or facility. Administrator or personnel in the information committee of KOSRO can create new ID and password for newly constructed hospital anytime. Hospital ID was named as 'ro***' and started from ro001 in the order of alphabet of Korean character, Hangeul. ID for board member was separately named as 'bm***', but it has only a right to review analysis of data without any input or managing data. Information of hospital or board member was already entered into the user list by administrator before opening of statistical program. Pre-set ID and password by administrator was known to each hospital or board member through emailing by KOSRO executive office.

Login page is very simple with only window for entering ID and password and intro-page after login has all information and button for linking directly to sub-menu or sub-directory. Main page has 3 different part of system; bar menu to operate including input or analysis, table display to know status of data entering, and notice and information. Main page and all sub-directory was wholly composed and displayed to be friendly to user. Users access easily to all menus by clicking link button in centralized menu in main page of statistical program.

Results

The statistical program has two separate top menus: input of statistics and real-time analysis of entered statistics. First, in
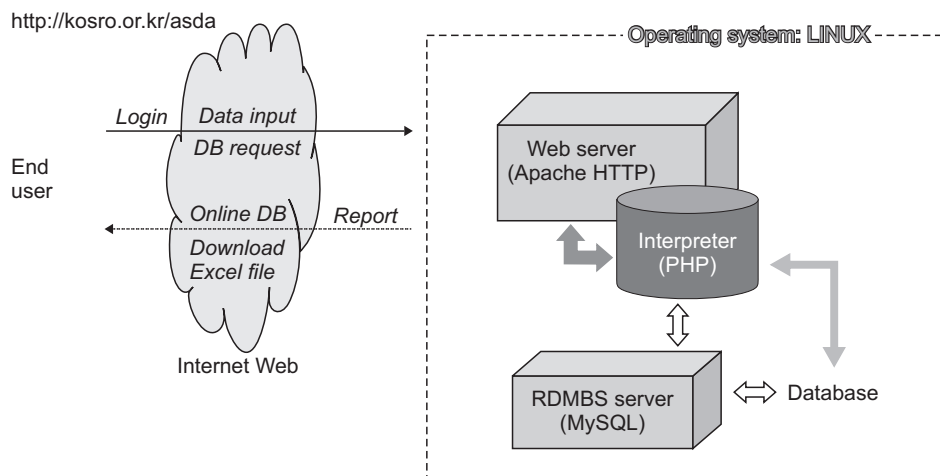

Fig. 1. Schematic diagram of new online statistical program. RDMBS, related database management system.

the folder of input of statistics, there is five independent sub-categories: human resource, equipment, clinical statistics, specialized treatment, and research achievement. Second, there is updated status of each statistics of five parts and additional information of member hospitals of the KOSRO in the folder of analysis of entered statistics.

Level of information to be accessed in statistical program is different by their position in the KOSRO. Administrator and assistant administrator of information committee has right to access fully and edit or update statistical program, and can access exclusively to the data backup composed by Excel sheet. Each hospital has an access right only to its own data input

Fig. 2. Human resource and year as one of top categories for data input.

Fig. 3. Equipment of radiation oncology.

and analysis. Board member has no right to enter data, but can access to all analysis or results of entered statistics.

Year of data is one of top category of entering data for the convenience of users. In the top each page of data input, user can change designated year at any time. As year changes, all sub-categories should be changed according to already entered data and user can call data at any year previously entered. This system can minimize labor to enter repeated data that is not changed from last year (Fig. 2).

1. Human resource

Human resource or manpower is composed of three items: specialist, resident, and physicist. Specialist is defined as a radiation oncologist who has board certificate of radiation oncology and includes staff physician and clinical fellows. Resident is a person in training position in each certified course of residency course to be a radiation oncologist. Item of physicist has a few different contents from those of medical

doctor, but has the same input system (Fig. 2). All contents are made with scroll-down menu as many as possible.

2. Equipment

Equipment category has five items: external beam radiation therapy (RT), brachytherapy, simulation, radiation therapy planning (RTP) & oncologic information system (OIS), and special devices. All contents can be entered by scroll down menu and direct typing input is also permitted (Fig. 3). However, selection in scroll-down menu is recommended if possible for uniform data analysis.

3. Clinical statistics

The third category is clinical statistics. This category permits two different level of data input for number of yearly treated patient. User can enter only total number of patients of each classification or each number of patients according to detailed classification. If he or she wants to enter number as detailed

Fig. 4. Clinical statistics.

classification, the box of detailed classification should simply be checked and new sub-list will be opened (Fig. 4).

4. Specialized treatment
Specialized treatment is separated from clinical statistics and comprises five items: stereotactic radiation therapy (radiosurgery or SABR), intensity-modulated radiation therapy (IMRT), respiratory-gated radiation therapy, brachytherapy, and proton or particle therapy. This category needs to enter total number of yearly treated patients by specific treatment methods.

5. Research achievement
Research achievement is divided by three items: clinical radiation oncology, radiation biology, and radiation physics. User can enter number of articles of accepted for publication in domestic or international journal in a year. Users can analyze yearly increase or decrease of publication of their hospital or institute.

6. On-line report of analysis
Analysis of entered data is reported on the website in real-time. All report has the same structure and hierarchy with

that in categories of entering data. Users can select year and province to manage report setting directly in designated page and system reflects immediately it to report of analytical results. Statistical status view is also divided into five categories and an additional status of the KOSRO (Fig. 5).

7. Management of data input
This function is prepared for administrator to figure out and manage progress of entering data from each hospital and so cannot be found in client user mode. Real-time status of data input in each category of all hospitals is reflected by graphics in a table.

8. Backup of data as spread sheet
This function is also exclusively accessed by administrator or assistant administrator of information committee. The operation is the same with that of on-line report system and its data should be changed when the year or province box is checked or not. Spread sheet, basically Excel file, is produced by order and can be downloaded to local computer (Fig. 6). Data of each hospital, each province or all nation-wide hospitals can be produced. Download of spread sheet can be done by administrator, but all members of KOSRO can use this result

Fig. 5. On-line report of analysis.

Fig. 6. Downloadable spreadsheet for data backup.

with a permission of KOSRO.

Discussion and Conclusion

It is impossible to emphasize the importance of management of data generated by medical activity or patient information in excess. Most new medical progress or achievements are based on any past experience or work. Bioinformatics comes recently into many fields of sciences including medicine and its creativity in new era is explosively growing to find new concept or target. However, if there is no basic or big data of medical experience, further progress using informatics system is a house built on the sand.

The history of modern radiation oncology in Korea is relatively short compared with those of other specialties and generated medical data were kept well to date from old times. Some institutes or hospitals have been operating its unique computerized management system from the beginning and those data can easily be converted to other system without any additional work However, main problem to establish nation-wide collection of data comes from any difference in method of data collection, items of contents, terminology or naming of equipment, and many others.

The KOSRO has been trying to unify many differences in collecting data between hospital and developed web-based data management system formerly. For a last decade, we actively collect and used medical data produced by it. However, a desire to upgrade the established system came up because of many changes in environment of clinical practice for radiation oncology and started this project to develop new on-line statistical program to enhance the efficiency of data input or sampling.

This newly developed on-line statistical program shares its hierarchy and contents with old data management system. However, new system is more focused on convenience of user of the KOSRO and has better stratified structure for data input. This new program also realizes the real-time provision of entered data on web site as a form of datasheet and can give us an Excel spreadsheet for processing as an invaluable material. New online program is placed in the subfolder of the homepage of the KOSRO and so can be easily accessed by client and efficiently managed by administrator.

Based on new on-line program for data input and sampling for the KOSRO, we can collect many worthy data from each

institute or hospitals and furthermore expect them be able to be converted or processed as an invaluable materials for advancing radiation oncology.

In conclusion, new on-line statistical program is developed to collect data from nationwide departments of radiation oncology. Its function and operation was updated and its motto is the user-friendly and convenience. Intuitive screen and consistent input structure is expected to promote entering data of member hospital. Annual statistics produced by this new on-line statistical program can be a cornerstone of advance in radiation oncology and the KOSRO.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Acknowledgments

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