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Trends in Radiation Therapy Facilities-1986 to 1991

Charn Il Park[1], M.D., Seong Yul Yoo[2], M.D.

Department of Therapeutic Radiology, [1]Seoul National University College of Medicine, [2]Korea Cancer Center Hospital, KAERI, Seoul, Korea

The Korean Society of Therapeutic Radiology has periodically conducted a national survey on the status of radiation therapy facilities in Korea. This paper summarizes survey data on the status of radiation therapy facilities, manpower, megavoltage equipments, patient load, types of procedures performed and charaterisrics of the patients treated.

Key Words: *Radiation therapy facilities, Manpower, Megavoltage equipments, Patients.*

INTRODUCTION

Two series of national surveys were performed in June, 1987 and August, 1992 for the patterns of the practice of radiation thereapy in Korea to establish a current list of all facilities in which megavoltage radiation therapy is practiced and to prepre adequate structures for the performance of quality care. The survey list contained basic informations about each facility, including the number of facilities, the number of new patients treated per year, the type of treatment equipment available at the facility, the number of radiation oncologists practicing at the facility, other personnel including radiation physicists and related personnels.

The summary results from the surveys are useful in two aspects: Fist, the result provides a current inventory of the resources, both manpower and megavoltage equipment. Data reveal the growing pattern of the facilities, proportion of megavoltage equipment and quality of patient's treatment between 1986 and 1991. Second, based on these data, we evaluate whether the number of radiation oncologists today matched the nation's need and estimate the projected need. mate the projected need.

For these reasons, national surveys will be conducted periodically by the Korean Society of Therapeutic Radiology to provide an update report.

Address for correspondence: *Charn Il Park, Department of Therapeutic Radiology, College of Medicine, Seoul National University, #28 Yongun-Dong, Chongro-Gu, Seoul, 110-460, Korea TEL) 02-760-2520*

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METHODS AND MATERIALS

The survey list contained questionaire regarding the personnel, patient load, type of treatment equipment and other summary information. The first survey was performed in June 1987. The facilities were requested to provide information between January 1, 1986 and December 31, 1986. The second survey was performed in the same way in August, 1992 for the same information between January 1, 1991 and December 31, 1991.

The survey forms were mailed to each facility with a request that a completed questionaire be returned within one month of receipt. As the survey replies were returned, data were inputted into a computer. If other inconsistencies were found, those problems were solved by telephone contact. The survey lists were sent to 24 facilities in the first survey and 37 facilities in the second survey.

RESULTS

Number of facilities

The number of radiation therapy facilites with megavoltage equipments is shown in Table 1. The number of radiation therapy facilities had increased dramatically from the 1970's to the 1980's. The total number of facilities with megavoltage equipments increased by about 50% from the 1987 survey to the 1991 survey. By January, 1992, the total number of facilties is 37. Of these, 43% (16/37) of facilities are located in Seoul, but this figure was reduced from 54% (13/24) in the 1987 survey.

Number of patients treated

Each facility was requested to provide the information on the number of new patients treated there for the survey period. Each facility was also asked to estimate the percentage of patients treated with curative or palliative intent in the first survey. These estimations varied considerably from facility to facility. The data from the first survey suggested that approximately 50% of new cancer patients in radiation therapy were treated with curative intent.

The number of new paients reported by the facilities was 8,412 in the calendar year 1986 and 12,816 in the calendar year 1991. The number of new patients has increased by approximately 35% during this 5 year interval (table 1). Among 37 facilities, 16 facilities treated more than 400 new patients per year. Of those, 4 facilites treated more than, 1,000 new patients per year. The remaining 21 facilities treated less than 400 new patients per year. This means that the number of new patients who receive radiation therapty is quite variable depending on the hospital's activity. But the average number of new patients per facility remained constant at 350. The distribution of cancer patients by anatomical site who were treated with radiation therapy in 1986 and 1991 also changed over 5 years as shown in table 2.

Number of megavoltage equipments.

The number of facilities has increased slightly, but the actual number of megavoltage equipments has increased rapidly, mainly in the form of linear accelerators that have doubled in number, as compared to cobalt 60 units that have not been further installed since 1986. This suggests that treatment machine in a new radiation therapy facility and second machines in an existing facility installed were linear accelerators and in many facilities cobalt 60 unit has ben replaced by linear accelerators since 1987 (Fig. 2).

Table 1. Summary results from the 1st and 2nd surveys of radiation therapy facilities

	1st survey	2nd survey
	Jan. 1986-Dec. 1986	Jan. 1991-Dec. 1991
No. of facilities	24	37
Total radiation therapist	45	58*
Medical physicist	10	22
Treatemtn machine		
cobalt	15	15
linear accelerator	21	38
simulator	24	35
planning system	21	33
brachytherapy		
LDR	13	8
RALS	9	22
Total new patients	8,412	12,816

*8 persons who retired various reasons are excluded.

Table. 2. Distribution of new patients by site

	1st survey	2nd survey
Site	Jan. 1986-Dec. 1986	Jan. 1991-Dec. 1991
Total	8,412	12,816
Gyn	2,297 (27.3%)	2,645 (20.6%)
Lung	1,175 (14.0%)	2,014 (15.7%)
GI	940 (11.2%)	1,906 (14.9%)
H&N	399 (4.7%)	1,289 (10.1%)
Breast	513 (6.1%)	746 (5.8%)
NHL	213 (2.5%)	304 (2.4%)

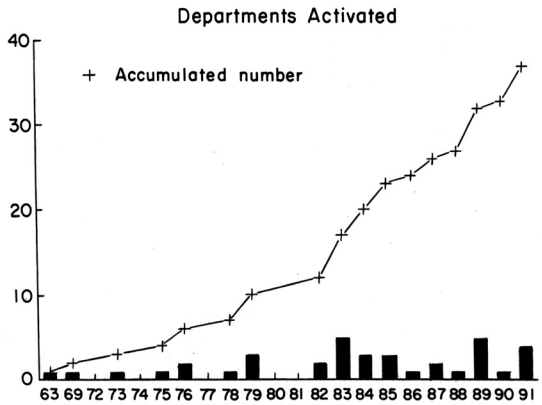

Fig. 1. Accumulated number of facilities by year

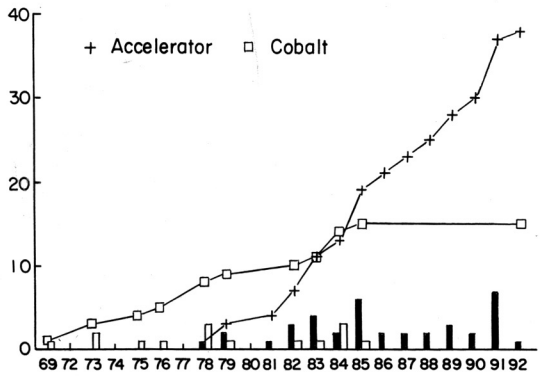

Fig. 2. Accumulated number of megavoltage equipment by year

The average number of new patients per equipment was 241 per year in 1991 and 234 per year in 1986. Therefore, both megavoltage equipment and new patients are increasing in number.

The 1991 survey provided data on the energy of the linear accelerators. Of 38 units, 19 produced a x ray beam of at least 10 MV energy with eletronf beams, whereas 18 produced a beam of less than 10 MV.

The surveys included questions on the use of simulators and treatment planning computers, but did not include the physics quality assurance program. Because of these reasons, it was not possible to evaluate whether the practice of radiation therapy in each facility was optimum. However, in the 1991 survey, 94% (35/37) of the facilities had simulators and 89% (33/37) of facilities had treatment planning computers. 81% (30/37) of the facilities had brachytherapy units. Of these, 8 facilities had low dose rate units and 22 facilities had a remote-after-loading system (RALS).

DISCUSSION

Clinical physicists

Considering a physics support, the 1992 survey reported that almost 60% of the facilities had the support on a full time basis, compared to 40% in the 1987 survey. Clinical physicists are concerned with three areas of activity: clinical service and consultation, research and development, and teaching. On the average their time is divided about equally among these three areas.

The concept of residency training is based on the fact that, in addition to the basic academic background in physics, a clinical physicist needs organized clinical training before assuming professional responsibility in a clinical practice. A M.S or Ph.D degree in physics or medical physics is not adequate for clinical physics practice. We feel that medical physics graduates from accredited programs could be required to have a minimum 2-years of residency training under the supervision of a qualified physicist in hospital.

There were 22 medical physicists in practice in 1991. The manpower needs in this field are expected to grow steadily. While radiation therapy continues to be the major field of employment for clinical physicist, new developments and greater sophistication in treatment equipments and procedures for diagnostic radiology and nuclear medicine have brough about a substantial increase in position available for medical physicists. However, the hospital based residency training program for clinical physicists is not established yet in Korea. It has been discussed and debated over many years between the Korean Society of Therapeutic Radiology and Korean Association of Physicists in Medicine.

The establishment of the training program for medical physicists with an associated academic society could have a significant impact on the future scientific as well as professional development in this field.

Current numbers and demand for radiation oncologist

The 1991 survey reported that there were 58 radiation oncologists practicing in 37 facilities. There was 45 radiation oncologists practicing in 24 facilities in the 1987 survey. Twenty-one radiation oncologists were generated during these 5 years, but 8 radiation oncologists retired from practice for various reasons, so the total growth rate is 4.2 persons per year but the net growth rate is 2.6 persons per year. This is the reason why the need and supply was balanced by 1992.

The estimate of manpower planning should be made with a number of assumptions about popula-

tion growth, number of new cancer patients and number of residents in training.

It is estimated that the incidence rate of cancer would be approximately 200 per 100,000 population in the year 2,000 according to population growth, aging of the population and changes in the risk of cancer anticipated. The Ministry of Health and Social Affairs Report projected a Korean population of 47 million by the year 2,000 and 90,000-100,000 cancer patients diagnosed at that time according to the risk rate of 200 per 100,000 population.

In the U.S.A., 50-60% of patients with cancer will receive radiation therapy. Data for the proportion of cancer patients currently treated by radiation therapy are not available in Korea. However, the major cause of cancer death in Korea is stomach cancer and hepatoma, occupying approximately 50%, in which radiation therapy is not frequently performed during their course of illness. Therefore, it may be assumed that approximately 30% of all patients with cancer in Korea will receive radiation therapy. Then it is estimated that 30,000 new patients with cancer will receive radiation therapy by the year 2,000 and this will be approximately 2.5 times the current number.

Radiation Therapy Oncology Group (RTOG) recommended that appropriate standards of care in clinical practice could be achieved if each radiation oncologist treated 200-250 new patients per year in the U.S.A. This figure did not include any allowance for teaching and research activities.

All radiation oncologists work at the 2nd or 3rd referral hospital in Korea and a radiation oncologist in academic facilities must be shared at least 30% of working time for educatin, research, administration and possible public work.

Therefore, the case loads of 300 new patients per year for one academic radiation oncologist in Korea may be reasonable because of the socioeconomic environment and the problem of medical insurance cost.

On the basis of these assumptions, the Korean Society of Therapeutic Radiology estimates that the projected need for radiation oncologists by the year 2,000 will be 100 radiation oncologists. The number of a certified radiation oncologist practicing in 37 radiation therapy facilities was 58 in 1991. There will be only remained a position to absorb a new increase of 40-50 radiation oncologists by the year 2,000.

The total number of residents in the training program was 35 in 1991. Some of those who are entering in 1990 will be in 4 ear training program and 14 residents entered to begin training in 1993. More than 10 radiaiton oncologists are generated annually between 1994 and 1998. Therefore, there are fewer job opportunities now relative to the number of residents completing training. The imbalance is expected to worsen in coming years. Most residents currently in training are well aware of this situation.

Data from the surveys seems to support the concept that there is a declining demand for radiation oncologist. An oversupply of manpower will result in some marginal practices with limited resources and diminished quality assurance.

The Korean Society of Therapeutic Radiology will make the guideline for a quality assurance program to objectively and systemically monitor and evaluate the quality and appropriateness of patient care delivered in the radiation therapy facilities.

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