

# Status of Medical Exposure in Korea

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Medical use of radiation is increasing in recent times and its influence on the population creates almost the same amount of annual natural background radiation in industrialized countries in particular. Thus, medical radiation has become a social issue. This paper is a brief report on the status of medical exposure in Korea by way of consulting from the radiation-related medical societies in Korea.

Keywords : Medical Exposure, Radiation Protection

## 1. INTRODUCTION

In modern times, human life span is continuing to lengthen and people want more health and welfare. The use of radiation in health care has led to major improvements in the diagnosis and treatment of human disease. Medical use of radiation is by far the largest contributor to the exposure of the general population from artificial sources [1,2]. Such radiation medicine creates a new social issue in developed countries as a safety culture [1-4].

There are three qualified medical specialties applying radiation to human beings to control and cure their diseases, in terms of diagnostic radiology, radiation oncology and nuclear medicine. We have tried to ask questions to the above radiation-related Societies about the status of radiation protection and introduce some of them here.

der [5]. Thereafter, annual number of patients who received radiation therapy increased over the past 10 years as shown in table 1. Table 2 & 3 show the nationwide infrastructures of radiation oncology in view of manpower and machines. Most of the figures revealed 3 to 5 times since the mid 1980's.

## 2. Materials & Results

### 2.1 Trends in radiation oncology

The major causes of death in Korea are cancer, cerebro-vascular accident, and heart disease, in decreasing or-

**Table 1.** Annual Number of New Patients Who Received Radiation Therapy.

Year	No. of patients (%)
1986	8,412(100)
1990	12,916(153)
1993	16,095(191)
2000	21,345(254)
2003	26,920(320)
2006	37,215(442)

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**Table 2.** Trends in Radiation Oncology Infrastructure in Korea : Manpower.

	1986	1993	2000	2007
Facilities No.	24	37	52	66
Radiation Oncologist	28	67	112	139
Resident	18	47	15	53
Medical physicist & dosimetrist	10	25	46	66
Technologist	N/A	162	250	388
Nurse	N/A	N/A	84	138

**Table 3.** Trends in Radiation Oncology Infrastructure in Korea : Machines.

	1986	1993	2000	2007
LINAC	21	39	71	100
Co-60	15	15	8	2
$\gamma$ -knife	0	3	5	12
Cyberknife	0	0	0	5
Tomotherapy	0	0	0	5
Proton	0	0	0	1
CT simulator	0	0	5	22

## 2.2 Trends in diagnostic radiology

Government and radiation related societies made task force teams to evaluate the nationwide current status of machines and manpower in order to overcome problems encountered. KFDA (Korean food and drug administration) has surveyed quality assurance problems in medical fields in not only machines but also radiation workers' health af-

fairs (Table 4 & 5). Figure 1 shows the improved working conditions for radiation workers along with their health.

Table 6 shows an increased use of CT scans as a diagnostic tool in view of the expenditures from the Health Insurance Review and Assessment (HIRA) which is only one health insurance organization operated by the government (Table 6)

**Table 4.** Nationwide Diagnostic X-ray Apparatus in Korea (2008).

	Clinic	Hospital	General H.	Total
Diagnostic X-ray	12,676	3,145	3,198	19,019
Diagnostic X-ray generator	5,470	949	1,167	7,586
Dental X-ray	27,615	574	341	28,530
CT	1,243	518	676	2,437
mammography	1,229	374	564	2,167

**Table 5.** Distribution of Annual Average Exposed Dose According to the Kind of Radiation Workers in Korea (2008).

Kind of occupation	No. (%)	Annual average exposed dose (mSv)	Cumulative effective dose (manSv)
Technologist	17,049 (35.7)	1.33	22,664.09
Physician	10,341 (21.6)	0.39	4,080.67
Dentist	10,945 (22.9)	0.21	2,285.45
Dental Hygienist	4,740 (9.9)	0.17	816.38
Radiologist	1,349 (2.8)	0.42	571.65
Nurse	1,248 (2.6)	0.66	822.01
Nurse' s aides	861 (1.8)	0.29	247.01
Helper	183 (0.4)	0.52	95.44
Others	1,107 (2.3)	0.34	378.38
Total	47,823 (100.0)	0.67	31,961.08

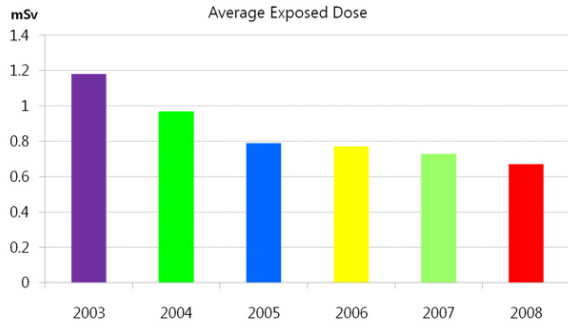


Fig. 1. Assessment of exposed doses in the radiation workers.

Table 6. Expenditure from HIRA (2009).

	1,000 won
Imaging diagnosis & radiotherapy	1,313,890,699(4.87%)
CT	850,410,897(3.15%)
MRI	235,969,776(0.87%)
PET	164,178,547(0.61%)
total	26,983,732,018(100%)

\* HIRA[6]: Health Insurance Review & Assessment

### 2.3 Trends in nuclear medicine

There shows a rapid increase of recently updated nuclear facilities, PET/CT, in not only manpower but also its clinical applications (Table 7).

## 3. Discussion

Radiation medicine is an essential tool for diagnosis and treatment of human disease. With regard to medical exposure of patients, it is not appropriate to apply dose limits or dose constraints, because such limits would often do more harm than good [1,2]. The emphasis is then on justification of the medical procedures and on the optimization of radiological protection [1-3]. In diagnostic procedures, justification of the procedures is related to the knowledge base of referring physicians and radiologists on radiation risk defining as reasonably achievable to the average person [3]. Equipment features that facilitate patient dose management and diagnostic reference levels derived at the appropriate national regional or local level are likely to be

the most effective approaches [1-3]. In radiation therapy, the avoidance of accidents is a predominant issue [1,2].

Finally, although it may be a personal opinion, well-planned education about radiation protection culture might be the most important policy toward the medical students and school students of radiation workers to solve future problems. In addition, legislators and regulators from the government would take on proper roles between the public and professionals [3].

## 4. Conclusions

Medical use of radiation is increasing year by year, especially CT scans and some areas of nuclear medicine. Current issues in medical exposure in Korea are almost the same as those of western countries.

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Table 7. Nuclear Medicine in Korea.

	Physicians	Residents	No. of PET/CT(PET)	No. of studies	No. of treatments
2009	156	132	129(14)	308,663	28,211
2008	146	118	113(14)	247,933	25,078
2007	145	100	85(12)	184,824	19,858
2006	136	79	56(10)	100,530	15,794
2005	119	72	44(10)	57,031	13,407
2004	119	68	30(11)	37,805	11,891
2003	110	54	16(11)	20,721	9,077