

## 11. Glossary of Terms<sup>11)</sup>

- **Accelerated fractionation**  
A type of irradiation involving multiple, fractional exposure during a day. The total course of treatment is shortened relative to that in standard fractionation by an equivalent or lower daily dose (1.8-2 Gy) than in standard fractionation.
- **Adverse effect**  
Any unfavorable and unintended sign, symptom, or disease observed during therapy or treatment, without regard to a causal relationship to therapy or treatment.
- **Beam's eye view**  
Image viewed apparently from the location of a radiation beam source, devised by computer reconstruction of a target outline and an at-risk organ outline input by a radiation therapist.
- **Biologically equivalent dose, BED**  
Conversion of absorbed dose distribution into biologically equivalent dose distribution based on factors such as radiation quality, irradiation time-pattern, and irradiation volume.
- **Bolus**  
A device made from a material similar in composition to the body which is placed on the surface of the body to transfer a buildup of dose distribution to the body surface and enhance dose at the body surface.
- **Brachytherapy**  
Divisible into sealed brachytherapy and non-sealed brachytherapy. See "Sealed brachytherapy".
- **Cancer**  
In a broad sense, the term cancer refers to all malignant neoplasms, and in a narrow sense, cancer refers to epidermal malignant neoplasms. Non-epithelial malignant neoplasms are termed sarcomas.
- **Carbon ion beam**  
Ionization of carbon atoms to produce heavy ion particles and acceleration of such heavy ions. Superior to a proton beam in relative biological effectiveness and concentration of dose, but construction costs for facilities are higher than those for proton beam.
- **Cesium-137**  
Radioisotope with a half-life of 30 years. Emits 660keV  $\gamma$ -rays; used primarily for procedures such as intracavitary and interstitial radiation.
- **Clinical target volume (CTV)**  
The volume of an area to be subjected to radiation based on suspicion of progression of microscopic cancer not visible to the unaided eye or through diagnostic imaging.
- **Cobalt-60**  
Radioactive isotope with a half-life of 5.3 years. Emits 1.17 and 1.33 MeV  $\gamma$ -rays. Used primarily for external irradiation.

- **Commissioning**  
Adjustment carried out after intake inspection at an individual facility to ensure accuracy suited to treatment plans and methods and to establish a baseline of performance data. Carried out primarily by a user prior to clinical use.
- **Compensating filter**  
A device which compensates for irregular body surfaces to create a uniform radiation dose distribution within the body, and which, in contrast to a wedge filter, is placed on the surface of the body or at an emission aperture.
- **Conformal radiotherapy, CRT**  
Irradiation method involving multi-directional irradiation using photon or particle beams, in which the shape of the irradiated field and the target coincide when viewed from any direction of irradiation.
- **Critical path**  
Standard treatment plan.
- **CT simulator**  
Used in three-dimensional radiotherapy planning as a substitute for an x-ray simulator; functions include projection onto patients of planning results for X-ray, CT-, and dose distribution calculating systems.
- **Cure**  
Completion of treatment in the status prior to onset of illness. Also used to indicate a rate of death after treatment equivalent to the rate of death from various causes in a sex- and age-matched standard population.
- **Definitive irradiation**  
Radiotherapy carried out with the objective of cure.
- **Dose volume histogram, DVH**  
Illustrates the relationship between the radiation dose in a target or other critical risk organ and the dose and volume in various organs; allows comparison of multiple treatment plans.
- **Radiotherapy quality controller, dosimetrist**  
A member of a radiotherapy team with training in the physics of radiotherapy equipment and radiation sources used to treat patients, and one with responsibility only for work concerning radiotherapy quality control.
- **EBM (evidence based medicine)**  
Medical treatment grounded in a scientific basis.
- **Electron**  
Elementary particle carrying a negative charge. X-rays are produced by accelerating and smashing electrons into a target. Also used in therapy as an electron beam.
- **Gamma ray**  
Electromagnetic radiation (photon beam) emitted from an unstable atomic nucleus. Examples include emission from cesium-137, cobalt-60, and radium-226.
- **Gross tumor volume, GTV**  
Volume of cancer to the extent visible to the unaided eye or by diagnostic imaging.

- **Hyperfractionation**  
A method entailing multiple exposures during a day using a single dose lower than the standard daily dose (1.8-2Gy) in a standard total course of treatment.
- **I-125 (Iodine-125)**  
Used in permanent implantation brachytherapy for prostate cancer. In Japan, treatment using I-125 has been pursued since 2003.
- **Informed consent**  
In determination of a treatment plan or method, obtainment of consent after thorough explanation to the patient/family.
- **Inspection on receipt (Intake inspection)**  
Testing carried out primarily by a manufacturer together with a user to check whether the precision of device performance characteristics matches specifications and whether operation is normal.
- **Intensity-modulated radiotherapy (IMRT)**  
A treatment method in which a single irradiated field is divided into multiple areas, and an optimal beam intensity is administered to each divided area.
- **Interstitial radiotherapy**  
A treatment method in which a sealed radiation source is applied interstitially within a specialized applicator positioned in a predetermined pattern.
- **Intracavitary radiotherapy, ICRT**  
Therapeutic method involving application of a brachytherapeutic source in an applicator (device) inserted in the uterus, vagina, or other such body cavity.
- **Intraoperative irradiation**  
Visually-guided electron beam irradiation of a focus in patients of inoperable or incompletely excised cancer.
- **Inverse planning**  
An inverted treatment plan in which dose and administration in tumors and normal tissue are determined by computer optimization by a 3-dimensional diagnostic imaging equipments in order to implement complex dose distribution
- **Ionizing radiation**  
Radiation produced by absorption of that portion of energy imparted to an atom when orbital electrons of the atom are released; considered photons carrying the classic electron bond energy of 10eV or more.
- **Iridium-192**  
Radioactive isotope with a half-life of 74 days. Emits 300-600keV  $\gamma$ -rays. Used in interstitial radiation and remote afterloading.
- **Linacgraphy**  
A check film used to verify an irradiated region.
- **Linear accelerator**  
Also known as a linac. A linear electron accelerator using electromagnetic microwave technology to generate a high-energy x-ray or electron beam.
- **Medical radiation physicist**  
Specialist with a masters or doctorate degree in physics and education and training in radiation physics for radiological diagnosis or treatment.
- **Megavoltage radiation**  
Ionizing radiation with energy equivalent to or greater than 1MV.

- **Microtron**  
External irradiation equipments which uses a circular accelerator to rotate electrons in a uniform DC field in a circular path.
- **Molecular targeted drug**  
Differences in the structure of cancer cells and normal cells are understood, as are mechanisms of cancer cell proliferation and metastasis, and it is believed that treatment can be provided with a minimal effect on normal cells if the properties representing distinct features of cancerous cells are attacked. A molecular targeted drug is one produced for this purpose.
- **Multi-leaf collimator, MLC**  
A column designed to produce an irregular irradiation field conforming to the shape of a target to be irradiated.
- **Oncology**  
The research area relating to tumors.
- **Symptomatic radiation therapy**  
Radiation therapy to prevent or alleviate symptoms caused by an illness.
- **Palliative radiotherapy**  
Radiotherapy with an objective of long-term tumor control in cases where cure is not anticipated.
- **Proton beam**  
Accelerated protons, the particles that form a hydrogen nucleus or a hydrogen positive ion. Concentration of dose is superior to that of x-rays, but the cost of facilities construction is high.
- **PTV, planning target volume**  
Volume of region where actual contact by radiation is anticipated.
- **Quality assurance**  
System-wide activities carried out to assure provision of adequate quality.
- **Quality control**  
Operational technologies and activities used to assure provision of requisite quality in a subsystem of a larger system.
- **Quality of life**  
Quality in living.
- **Radiation dose**  
The absorbed dose, threshold dose, tumor dose, deep dose, transmitted dose, or other amount of irradiated energy per unit mass in an absorbing structure under certain predetermined conditions.
- **Radiation oncologist**  
Physician specialized in tumors, and particularly treatment of tumors by radiation.
- **Radiotherapy**  
A therapeutic technique for treating tumorous illnesses and some non-tumorous illnesses with ionizing radiation.
- **Remote afterloading system (RALS)**  
Device and after loading technique for carrying out remote high-dose intracavitary irradiation.

- Risk management  
Risk management.
- Sealed brachytherapy  
Therapeutic technique using a sealed radioactive substance to provide radiation at a near-contact distance. Used in interstitial, intracavitary, and surface irradiation.
- Second opinion  
Assessment and explanation by another physician.
- Simulation  
In radiotherapy, precise determination of the location of an irradiation field for patient treatment by X-ray or CT exposure.
- Stereotactic irradiation, STI  
Therapeutic method allowing accurate irradiation of small foci by three-dimensional localization of targets. Includes stereotactic radiotherapy (SRT) involving fractionated irradiation and stereotactic radiosurgery (SRS) effected by a single irradiation.
- Total body irradiation, TBI  
A treatment method irradiating the entire body; used as a pretreatment in bone marrow transplant therapy to eradicate tumor cells and suppress immune reactions.
- Wedge filter  
Device used to increase the uniformity of dose in the irradiated volume by compensating for dose-distribution caused by irregular body surfaces, or by correcting maldistribution in a high dose area caused by factors such as two perpendicular beams.
- X-ray simulator  
Device used to check the incident direction and irradiated field of an external radiation beam by equating an external radiotherapy equipments and a number of theoretical conditions.

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## Appended Tables

I ) The required expenses in case that 250 patients are treated by radiation in one year in terms of mainly standardized modality.

### A) The required equipments & tools to provide radiation treatment.

	Equipments & Tools	Units	An estimated purchase price
1	Radiation treatment machine (dual energy with MLC)	1	
2	Dedicated CT simulator for radiation treatment	1	
3	Conventional X-ray simulator	1	
4	Radiation treatment planning system	1	¥290,000,000
5	Radiation treatment aids	Possess	
6	Measurement equipments for QA/QA (Dosimeter, Waterphantom, etc.)	Possess	
7	Network for IT	Possess	

Remarks) The period of amortization is 6 years and ¥48,335,000 is amortized per year.

### B) The required human resources to perform radiation treatment.

	Occupation	Persons	An estimated expenses
1	Radiation oncologist	1	
2	Radiation therapist	2	
3	Radiation treatment QA/QC manager	1	¥43,200,000
4	Dedicated nurse for radiation treatment	1	
5	Medical secretary for radiation treatment	1	

### C) The annual maintenance fees and utilities' expenses for radiation treatment equipments & tools

	Equipments & tools	Units	An annual maintenance fee, etc.
1	Radiation treatment machine (dual energy with MLC)	1	
2	Dedicated CT simulator for radiation treatment	1	
3	Conventional X-ray simulator	1	
4	Radiation treatment planning system	1	¥9,000,000
5	Radiation treatment aids	Possess	
6	Measurement equipments for QA/QC (Dosimeter, waterphantom, etc.)	Possess	
7	Network for IT	Possess	
8	Electricity, water, etc.		¥1,000,000

9	(cont'd) Consumable items, etc.	¥3,000,000
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II) The annual income paid by reimbursement in case that 250 patients are treated by Radiation in one year in terms of mainly standardized modality.

	Treatment modality	Patients	An estimated annual income
1	One port or two opposite ports treatment	90	
	Second target treated by one or two opposite ports	20	
2	Non two opposite ports or three ports treatment	90	
3	four ports or more, arc or dynamic conformal treatment	45	¥86,200,000
4	Stereotactic treatment	20	
5	Total body irradiation	5	

I) The required expenses in case that 100 patients are treated by Radiation in one year in terms of mainly simple modality.

A) The required equipments & tools to provide radiation treatment.

	Equipments & tools	Units	An estimated purchase price
1	Radiation treatment machine (single energy without MLC)	1	
2	Dedicated CT simulator for radiation treatment	None	
3	Conventional X-ray simulator	1	
4	Radiation treatment planning system	1	¥111,000,000
5	Radiation treatment aids	None	
6	Measurement equipments for QA/QA (Dosimeter, waterphantom, etc.)	None	
7	Network for IT	None	

Remarks) The period of amortization is 6 years and ¥18,500,000 is amortized per year

B) The required human resources to perform radiation treatment.

	Occupation	Persons	An estimated expenses
1	Radiation oncologist: One temporally, (twice a week equivalents 0.4 of full-time)	0.4	¥28,600,000
2	Radiation therapist; 2 persons ( 0.5 of full-time per person)	1.0	
3	Radiation treatment QA/QC manager; one full-time person	1.0	

(cont'd)

4	Dedicated nurse for radiation treatment; one person (0.5 of full-time)	0.5
5	Medical secretary for radiation treatment; none	0.0

C) The annual maintenance fees and utilities' expences for Radiation Treatment equipments & tools

	Equipments & tools	Units	An annual maintenance fee, etc.
1	Radiation treatment machine (single energy without MLC)	1	
2	Dedicated CT simulator for radiation treatment	None	
3	Conventional X-ray simulator	1	
4	Radiation treatment planning system	1	¥4,750,000
5	Radiation treatment aids	None	
6	Measurement equipments for QA/QA (Dosimeter, waterphantom, etc.)	None	
7	Network for IT	None	
8	Electricity, water, etc.		¥750,000
9	Consumable items, etc.		¥1,800,000

II) The annual income paid by reimbursement in case that 100 patients are treated by radiation in one year in terms of mainly simple modality.

	Treatment modality	Patients	An estimated annual income
1	One port or two opposite ports treatment	80	
	Second target treated by one or two opposite ports	20	
2	Non two opposite ports or three ports treatment	15	
3	four ports or more, arc or dynamic conformal treatment	5	¥29,820,000
4	Stereotactic treatment	0	
5	Total body irradiation	0	

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以降 3/3 冊は雑誌ですので、下記をご参照ください。

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