

SAFETY PHILOSOPHY OF  
PARTICLE ACCELERATORS IN MEDICAL PRACTICE

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Abstract

The International Electrotechnical Commission (IEC) set up in 1966 the Technical Committee No.62 with a view to formulating international standards for electrical equipment used in medical practice and, in this connection, safety problems of medical electron accelerators in the range 1 - 50 MeV have been under consideration since 1972 by a Working Group (SC62C-WG1) of this organization. Figure 1 shows a Japanese proposal submitted to IEC for systematic understanding of radiation safety problems. The latest Draft (IEC/62C(Central Office)4, September 1976) reminds the authors of both aspects in radiation safety for the patient, namely, limitation of dose and control of dose.

The latter conception of dose control<sup>(1)</sup> places emphasis on safeguard against wrong operation and failure of the equipment, or in other words, foolproof and fail-safe. Foolproof is attained by interlocking mechanism and fail-safe by redundancy or duplication in electrical and mechanical designs.<sup>(2)</sup>

The author was motivated to make clear some underlying principles in medical application of particle accelerators by the recent IEC safety philosophy of medical electrical equipment,<sup>(3)</sup> according to which the following considerations seem quite basic:

1. Safety for whom?: the patient, the occupational individuals and the general public.
2. Nature of inherent hazards: radiation, fire, explosion, excessive high temperature, noxious gas production, electrical, mechanical and any other hazard(s) if present.
3. Degree or ranking of safety achieved: unconditional, conditional or descriptive.

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References

1. U. K. Department of Health and Social Security:  
Code of Practice for the Protection of Persons against Ionizing Radiations arising from Medical and Dental Use (Third edition 1972, Third impression 1976),  
Appendix H: Report of the Radiotherapy Apparatus Safety Measures Panel on requirements for dose control of high energy X-rays and electrons. (pp 100 - 102)

2. R.J. Post: Some considerations of Interlocking and Safety Circuits for Radiotherapy Apparatus, Int. J. of Radiation Engineering, 1971, 1(2), 169 - 191.
3. IEC Report 513 (1976): Basic Aspects of the Safety Philosophy of Electrical Equipment Used in Medical Practice.

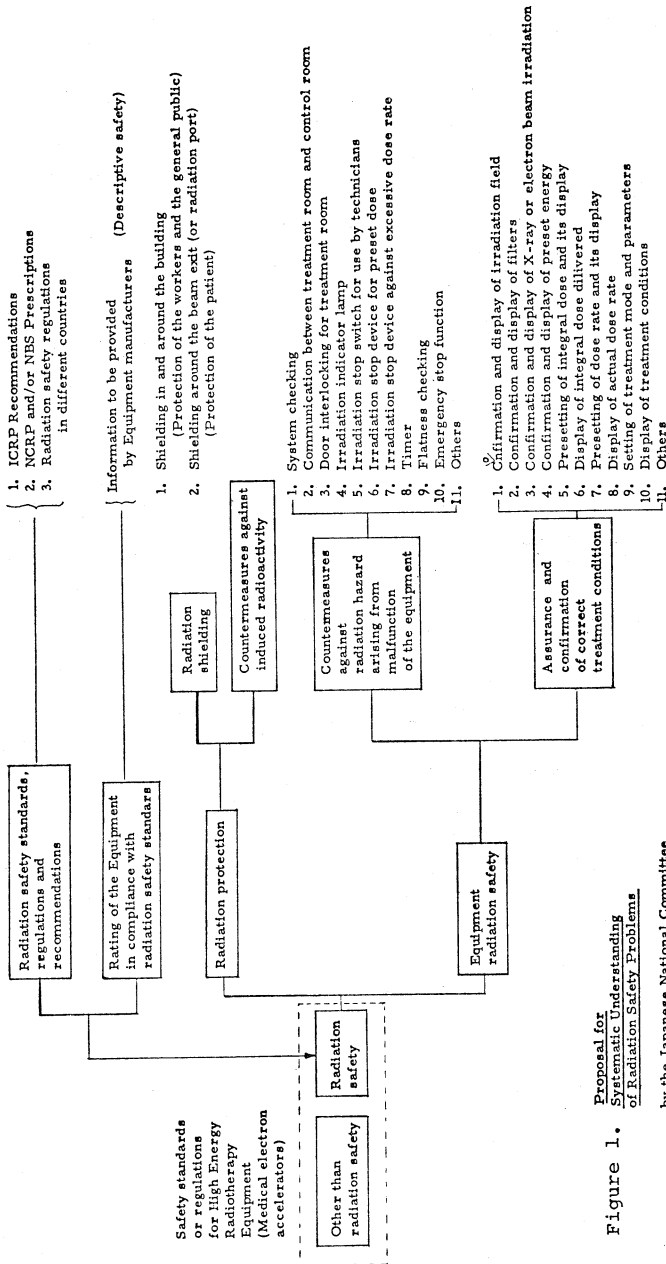


Figure 1.  
 Proposal for Systematic Understanding of Radiation Safety Problems  
 by the Japanese National Committee on IEC/SC62C-WG1, July 1972