

Core of knowledge for a licence to use irradiating apparatus for the purpose of medical imaging (cardiology, urology, orthopaedic and vascular procedures)

This core of knowledge summarises the basic level of radiation safety knowledge an applicant must demonstrate to be granted a licence under the *Radiation Protection Act 1965* to use irradiating apparatus for the purpose of medical imaging, restricted to the use of x-ray equipment in cardiology, urology, orthopaedic and vascular procedures.

Applicants can demonstrate that they have the required knowledge by:

1. completing an NRL-recognised training course (including an end-of-course assessment), or
2. providing documented evidence of other training addressing the core of knowledge.

Please contact the National Radiation Laboratory for further information regarding recognised training courses.

Required knowledge

Applicants must display knowledge in all of the modules set out below.

The depth of knowledge required for each topic is indicated using the following scale:

- (1) Introductory.** Overview and familiarity only.
- (2) Working.** Knowledge gained should be able to be used in problem solving and practical situations.
- (3) In depth.** In addition to a working knowledge there should be a good understanding of the underlying basis or theory.

Module	Nature and sources of ionising radiation
Standard 1	<ul style="list-style-type: none">• Electrical production of X-rays (2).• Types and characteristics of radiation (<i>X-ray</i>) and its interaction with matter (2).• Quantities and units (activity, absorbed dose and effective dose) (2).• Sources of ionising radiation (natural and artificial) (1).

Module	Biological effects of ionising radiation and associated risks
Standard 2	<ul style="list-style-type: none">• Damage mechanisms (2).• Whole body and extremity exposures (2).• Deterministic effects; skin erythema, cataracts, LD₅₀ etc (2).• Stochastic effects; cancer and hereditary effects (2).• In utero exposures (2).• International Commission on Radiological Protection's risk factors and radiation risks in perspective (2).• Public perception and communication of radiation risk (2).

Module	International Commission on Radiological Protection's principles of radiation protection
Standard 3	<ul style="list-style-type: none">• Justification (2).• Optimisation ('as low as reasonably achievable ') (2).• Individual dose limits: occupational (whole body, extremities and pregnant women) and public (2).• Dose constraints (2).

- Module**
Standard 4
- Legal framework and regulatory authority**
- The *Radiation Protection Act 1965* and amendments and the *Radiation Protection Regulations 1982*. Particular emphasis should be placed on owner and licensee obligations (2).
 - Role of the National Radiation Laboratory (NRL) and compliance monitoring (2).
 - Reporting of radiation incidents to NRL (including NRL's incident report form) (2).
- Module**
Specific 1
- Incidents (focussing on medical x-ray fluoroscopy equipment)**
- Review of incidents reported worldwide (1).
 - Discussion of lessons learned (2).
 - Recognition of a radiation incident, immediate actions, and how it should be investigated and reported (2).
- Module**
Specific 2
- Practical radiation protection**
- *Code of Safe Practice for the use of x-rays in medical diagnosis NRL C5, 1994* (2).
 - Model radiation safety plan (2).
 - The need for and the benefits of personal monitoring. To include: advantages and uses of different types of personal monitors and the meaning of doses reported in relation to dose limits and dose action levels (2).
- Module**
Specific 12
- Radiation protection characteristics of medical fluoroscopic equipment and its safe use**
- Types, principles (e.g. image receptor dose rates, automatic dose rate control etc) and known hazards of operation (2).
 - Primary beam characteristics (filtration, kV, mA) (3).
 - Image quality parameters (e.g. resolution, contrast) (2).
 - Scattered radiation (characteristics; dependence on radiation output, beam area, distance; angular dependence) (2).
 - Leakage radiation (2).
 - Practical application of the 'as low as reasonably achievable' principle with a particular emphasis on minimising:
 - Patient doses: to include screening time, field of view, dose modes (magnification, pulsed, last image hold), use of a grid, automatic dose rate control (effect of patient size), dose-area product and measurement of skin dose (2).
 - Staff doses: to include time, distance, shielding (e.g. coats, drapes, bucky covers) (2).
 - Role of quality control (equipment performance and safety testing) (1).
 - Typical patient doses (to include patient entrance surface doses) (3).