Radiography: IRMER and IRR- Radiation Protection and Legal Requirements in Dental Imaging

Aims: To provide an overview of the statutory requirements in dental radiography including Ionising Radiations Regulations (IRR17) together with its Approved Code of Practice, Ionising Radiation (Medical Exposure) Regulations 2017 IR(ME)R17 and the Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment.

Objectives: On completion of this verifiable CPD article the participant will be able to demonstrate, through completion of a questionnaire, the ability to:

- Demonstrate knowledge of the statutory requirements in dental radiography, including the Ionising Radiations Regulations (IRR), Ionising Medical Exposure Regulations (IR(ME)R) and The Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment.
- Identify the roles and responsibilities of the Radiation Protection Supervisor, the Radiation Protection Advisor, and the Medical Physics Expert.
- Identify contents of the local rules as specified in the IRR.
- Identify the four types of duty holders specified under IR(ME)R.
- Identify the principles of radiation protection.
- Complete an on-line assessment, scoring over 70%.

Introduction

In the UK, the statutory requirements for dental radiography involve compliance with the Ionising Radiation (Medical Exposure) Regulations (IR(ME)R2017) and Ionising Radiations Regulations (IRR17). Additionally, dental professionals must adhere to the guidance provided by the Health and Safety Executive (HSE) and the Faculty of General Dentistry (FGDP) (College of General Dentistry).

Legislation

There are two sets of regulations in the UK governing the use of ionising radiation and they both form part of the Health and Safety at Work Act 1974. These are:

1)The Ionising Radiations Regulations 2017 (IRR17)[1]

IRR17 is made under the provisions of the Health and Safety at Work Act 1974 and came into force on January 1st, 2018. The Approved Code of Practice and guidance will help employers comply with their duties under the IRR17.[2]

The IRR17 are primarily concerned with the radiographic equipment, the workers and the public and are enforced by the Health and Safety Executive. The legislation covers:

- **Registration with the HSE.**
- Equipment, including critical examinations.
- **The appointment of a Radiation Protection Advisor (RPA) and Radiation Protection Supervisor (RPS).**
- Dose limits for occupational exposure. Radiation doses to staff and other persons must be kept as low as possible and must not exceed the specified dose limits. Dose assessments must be carried out and recorded.
- Design of dental and radiography facilities including safety and warning signs and contingency plans. The employer must prepare a contingency plan designed to ensure, as reasonably practicable, the restriction of exposure to ionising radiation and the health and safety of people who may be affected by a radiation accident. These should arise from the risk assessment and should be included in the Local Rules
- The designated controlled area.
- Radiation risk assessment.
- Personal protective equipment.

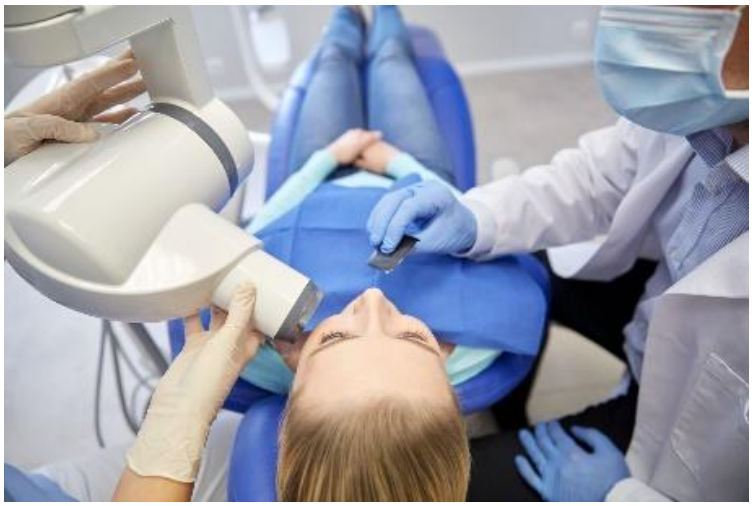
- **Information, instruction, and training.**
- **Local rules.**
- **Training.**[2,3]

The legal person and employee must:

- Not knowingly expose themselves or any other person to x-rays to an extent greater than is reasonably necessary for the purposes of their work.
- Exercise reasonable care when working on any aspect of dental radiology.
- Immediately report to the legal person whenever they have reasonable cause to believe that an incident or accident has occurred with the x-ray equipment and they or some other person has received an overexposure.

The full IRR17 regulations can be downloaded from the end of this article in the further reading section, as can the Approved Code of Practice and Guidance. The items highlighted in blue will be discussed further in this article, and the remaining areas will be discussed in other radiography CPD available on the website.

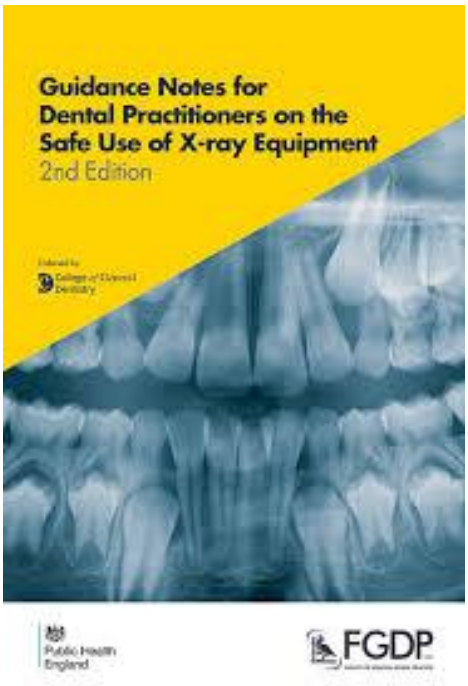
2)The Ionising Radiation (Medical Exposure) Regulations 2017 (IR(ME)R17)[4]



IR(ME)R17 is primarily concerned with safeguarding the patient and other exposed people, including comforters and carers. These are enforced in the UK by: The Care Quality Commission (CQC) in England; the Healthcare Inspectorate Wales (HIW) in Wales; the Scottish Executive (SE) in Scotland; and the Regulation and Quality Improvement Authority (RQIA) in Northern Ireland. It involves ensuring that every exposure of ionising radiation to the patient is justified, that positions of responsibility are defined, and that there is quality assurance programme.

The full IR(ME)R17 regulations can be downloaded from the end of this article in the further reading section.

Guidelines



The Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment 2nd edition were published in 2020. They set the standards for the safe use of x-ray equipment within dental practice in line with IRR17 and IR(ME)R17.

Other guidance documents include:

- Guidelines on Radiological Standards in Primary Dental Care.
- Selection Criteria for Dental Radiography 3rd edn (2018).

Registration with the Health and Safety Executive

Dental practices must inform the Health and Safety Executive (HSE) that they work with ionising radiation. Employers must apply to the HSE for certain work they do with

ionising radiation, and it is an offence to work with x-ray generators without doing so. The HSE has developed a graded approach to registration perceived on the risk associated with using ionising radiation.

Depending on the level of risk of the ionising radiation work, the employer may need to apply to:

- Notify
- Register
- Get consent

Dental x-ray equipment has been put in the middle grade, requiring registration. Registrations in England, Scotland and Wales all require an application to be submitted to HSE, along with the registration fee. Further information can be found here: https://www.hse.gov.uk/radiation/ionising/notifiy-register-consent.htm .

In Northern Ireland, the application for a registration must be submitted to the Health and Safety Executive for Northern Ireland and further information can be found here: https://www.hseni.gov.uk/overview-notification-registration-or-consent-work-ionising-radiation .

The Employer

In the IRR17 and IR(ME)R17, the term 'employer' typically refers to the individual or organisation responsible for ensuring compliance with the regulations and health and safety issues in the workplace where ionising radiation is used. All employers must have written procedures in place covering all aspects of radiography and radiation protection in the workplace, and the staff involved. This will include "providing a framework of written procedures, protocols and QA programmes within which the various duty holders undertake their functions."[3]

Radiation Protection Supervisor

The Radiation Protection Supervisor (RPS) is responsible for overseeing the safe use of radiation in dental procedures, ensuring compliance with regulations, and implementing safety protocols to minimise radiation exposure to both patients and staff. In particular, they supervise the arrangements set out in the local rules. The legal responsibility for supervision, however, lies with the employer. Ideally, the person appointed as the RPS will be an employee who works closely with dental radiography.

Radiation Protection Advisor

Under IRR regulation 14, a Radiation Protection Advisor (RPA) must be appointed who has the required knowledge and experience for the employer's type of work. This is an individual who provides expert advice and guidance on radiation safety practices. RPAs assist dental practices in implementing and maintaining effective radiation safety programmes, ensuring compliance with regulations, conducting risk assessments, and advising on equipment selection to minimise radiation exposure to patients and staff. The Guidance Notes state that the advice given by RPAs should cover the following:

- **Prior assessment of installation plans**.
- **Acceptance into service of engineering controls, design features, safety and warning devices in relation to new or modified radiation sources.**
- Drafting and review of risk assessment, local rules, and contingency plans.
- **Designation of controlled and supervised areas and subsequent requirements.**
- Working arrangements for pregnant employees.
- **Calibration of radiation monitoring equipment and checks on its condition.**
- Personal protective equipment.
- Designation of classified persons and personal dosimetry.
- Training programmes.
- Prevention, investigation, and analysis of accidents.
- Quality assurance.
- **Periodic testing of engineering controls, design feature, safety and warning devise and regular checking of systems of work.**

Consultation with an RPA for any advice on any of the matters indicated in bold is specifically required under section 14. An RPA or RPA body must have current certificates to demonstrate knowledge of the HSE's current criteria of core of competence.[3]

A list of individuals and RPA bodies holding current certificates can be found at: http://www.rpa2000.org.uk/list-of-certificate-holders/ and https://www.hse.gov.uk/radiation/rpnews/

Dose Limitation

Radiation doses are discussed in the CPD article, "Radiography: Fundamentals of X-Radiation, Radiation Dosage in Dental Imaging, and Potential Risks of Exposure", and is available on the website.

The International Commission on Radiological Protection[5] cover all aspects of radiological protection. The recommended system of dose limitation is summarised into three basic components. That is that there should be:

- Justification of practice
- Optimisation of radiation protection
- Dose limits for individuals at work and for members of the public

The primary concern is to keep exposures at the lowest practicable level. In English law this is known by the acronym ALARP which is keeping exposures:

As
Low
As
Reasonably
Practicable

This requirement is specifically included in the Ionising Radiations Regulations 2017 and employers deemed not to be keeping exposures as low as they reasonably, could be at risk of prosecution.

Roles and Functions Defined Under IR(ME)R

IR(ME)R identifies the following 4 duty holders and each of these have clearly identified responsibilities under the regulations:

1) **The Employer** (as previously discussed).

2) Referrer - a referrer is a registered practitioner, "who is entitled in accordance with the employers' procedures to refer individuals to an IRMER practitioner for medical (or non-medical) exposure. The referrer is responsible for ensuring that sufficient clinical information is provided to enable the IRMER practitioner to decide whether the exposure can be justified."[3] In the dental practice it is likely that the referrer and practitioner will be the same person.

3) Operator - These are individuals who are entitled in accordance with the employer's procedures, to carry out all or part of the practical aspects that are associated with radiography. This could include any of the following:

- Patient identification.
- Positioning of the image receptor, the patient, and the x-ray tube head.
- Setting exposure parameters.
- Pressing the exposure button.
- Processing radiographs.
- Interpreting and reporting of radiographs or dental CBCT images.
- Exposing test objects as part of the quality assurance programme.

4) Practitioner- An IRMER practitioner is the person who takes responsibility for an individual's medical exposure. This would be the dentist or DCP that is qualified to

take a dental radiograph. No exposure can take place unless it is justified by the IRMER practitioner. For an exposure to be justified the benefit to the patient from the diagnostic information should outweigh the detriment of the exposure. The IRMER practitioner should also consider exposures to “comforters and carers” when justifying the exposure to ionising radiation. A carer and comforter are individuals who help support the person undergoing the exposure.

When justifying an exposure, the IRMER practitioner should take into account many factors such as:

- The availability and findings of previous radiographs (or dental CBCT images).
- The specific objectives of the exposure in relation to the history and examination of the patient.
- The age of the individual (bearing in mind the increased radiosensitivity of children compared to adults).
- The total potential diagnostic benefit to the individual.
- The radiation risk associated with the radiographic examination.
- The efficiency, benefits and risk of alternative techniques having the same objectives but involving no, or less, exposure to ionising radiation.
- The information supplied by the referrer, including information available from previous radiographs.[3]

This means that the justification for the taking of a dental radiograph should be made on an individual basis. It is also important to ensure that the radiographs are not only justified but that their justification is recorded when the notes are taken. This is known as ‘authorisation’.

IRMER practitioners should be familiar with the Selection Criteria for Dental Radiography 3rd edn (2018). The following table gives the recommended frequency that radiographs may be taken depending on the selection criteria.

Selection Criteria	**Adult**
New patients to assess dental diseases and growth and development	Patient specific bitewings and selected periapicals (PA)
Growth and development	One-off PA or panoramic
High caries risk	Bitewings 6 months
Moderate caries risk	Bitewings annually
Low caries risk	Bitewings at 2-year intervals
Periodontal disease or history of periodontal disease	Patient specific radiographic examination

The justification for the frequency that radiographs are taken must be clearly marked in the patient's notes and the risks and benefits should be clearly explained to the patient.

Medical Physics Expert

Under regulation 14 of IR(ME)R, a Medical Physics Expert (MPE) must be appointed. The MPE plays a crucial role in ensuring compliance with radiation safety regulations, including IRMER. They provide expertise in the safe and effective use of radiation in medical procedures, advise on equipment selection and calibration, conduct quality assurance testing, advise on optimisation of doses to patients and contribute to staff straining and radiation protection measures. The RPA and MPE may be the same person as long as they have the RPA2000 certification and are also listed as an MPE by RPA2000.[3] A list of certificate holders as of February 2025, can be found here: https://www.rpa2000.org.uk/wp-content/uploads/2025/02/Holders-MPE-at-3-Feb-2025-1.pdf

Local Rules

Local rules must be provided for every controlled area. Local rules are a set of key working instructions for restricting exposure and include procedures for normal work as well as contingency plans for accidents and incidents and must be drafted with the RPA.

The Approved Code of Practice and Guidance gives the following information for content that should be included in the local rules:

Essential contents:

- The dose investigation level specified for the purposes of regulation 9 of IRR17.
- Identification or summary of any contingency arrangements indicating the reasonably foreseeable accidents to which they relate (regulation 13).
- Name(s) of the appointed RPS(s) (regulation 18(5)).
- Identification and description of the area covered, with details of its designation (regulation 19(1)).
- A summary of the working instructions appropriate to the radiological risk associated with the source and operations involved, including the written arrangements relating to non-classified persons entering or working in controlled areas (regulation 19(3)).[2]

Optional Contents

Employers may also find it useful to include a brief summary or reference to the general arrangements in that area for:

- Testing and maintenance of engineering controls and design features, safety features and warning devices;
- radiation and contamination monitoring;
- examination and testing of radiation monitoring equipment;

- personal dosimetry;
- arrangements for pregnant and breastfeeding staff;
- details of significant findings of the risk assessment, or where it can be found;
- a programme for reviewing whether doses are being kept as low as reasonably practicable and local rules remain effective;
- procedures for initiating investigations etc;
- procedures for contacting and consulting the appointed RPA;
- details of the management and supervision of the work; and,
- procedures for ensuring staff have received sufficient information, instruction and training.[2]

Training on the employer's local rules can be provided by in staff training. Records should be kept confirming that staff have read and understood the local rules.

Quality Assurance

Both the IRR(17) and IR(ME)R 2017 place clear, but different responsibilities on the legal person to establish and maintain quality assurance programmes in respect of dental radiography. Quality assurance in dental radiography refers to a set of procedures and standards designed to ensure the consistent production of high-quality diagnostic images while minimising the radiation exposure to patients and staff. It involves systematic monitoring, evaluation and maintenance of all aspects of the radiographic process.

The aims of a quality assurance programme in dental radiography are:

- To produce radiographs that are of a consistently high standard.
- Reduce the number of repeat radiographs.
- To highlight sources of error so that they can be rectified.
- Reduce costs.
- Increase efficiency.
- To ensure that radiation doses to patients (and staff) are kept as low as reasonably practicable (ALARP).[2]

The essential procedures relate to:

- Image Quality
- Patient dose and x-ray equipment
- Darkroom, films, and processing
- Training
- Audits

Quality Assurance is covered further in another CPD article which is available on the website.

Information, Instruction and Training

The Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment 2nd edition discuss training for dental professionals. The full document can be downloaded from the further reading section of this article but some points on training from the document are as follows:

Employees who operate dental x-ray equipment

Employers must ensure that all of their staff who are trained and qualified to undertake X-ray exposures receive training that includes the following:

- Risks to health arising from exposure to dental X-rays.
- The significant findings of the risk assessment and precautions that need to be taken, in particular the specific requirements of the local rules and contingency plans at their place of work.
- The requirements of IRR17 relevant to dental radiography and the importance of complying with them.

IRMER Practitioners, referrers or operators that take radiographs, need to ensure that they complete IRMER training that meets their needs. The training that you complete depends on your needs at the time of completing it.

The recommended radiation content of verifiable CPD courses for IRMER practitioners and operators who undertake radiography are also set out in the 2020 Guidance notes as follows:

- The principles of radiation physics.
- Risks of ionising radiation.
- Radiation doses in dental radiography.
- Factors affecting doses in dental radiography.
- The principles of radiation protection.
- Statutory requirements.
- Selection criteria (IRMER Practitioners).
- Quality assurance.

You should source training in any new equipment or techniques that you introduce to your daily practice. All additional training that you complete should be logged and recorded.

Staff not directly involved with radiography

Staff that assist in other duties related to radiography such as processing films or phosphor plates, or non-clinical staff, should carry out training sufficient to their role and safety. This may include:

- Awareness that X-rays are used, the benefits and risks, and the need to avoid any personal exposure.
- Training in the requirements of the local rules.

The General Dental Council highly recommend that dental professionals carry out 5 hours of verifiable CPD on the subject of radiography.

Personal Development Plan and Reflective Learning

This CPD is linked to the following GDC Enhanced CPD Development Outcome:

C. Maintenance and development of knowledge and skill within your field of practice.
Reflective learning is now a requirement of the GDC Enhanced Professional Development Scheme. As such, you will be given the opportunity to answer some reflective learning questions, before your certificate is generated and can update this at any time.

The full IRR(17) and IR(ME)R(17) regulations can be reached by clicking on the links below:
IRR(17)
IR(ME)R17
IRR(17) Northern Ireland
IR(ME)R18

Further Reading
Health and Safety Executive (2017) Work with Ionising Radiation Ionising Radiations Regulations 2017 Approved Code of Practice and Guidance
Public Health England (2020) Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment 2nd Edition

References

1. Ionising Radiations Regulations (2017) Available at: https://www.legislation.gov.uk/uksi/2017/1075/pdfs/uksi_20171075_en.pdf (accessed 10/02/2025)
2. . Health and Safety Executive (2017) Work with Ionising Radiation Ionising Radiations Regulations 2017 Approved Code of Practice and Guidance. Available at: https://www.hse.gov.uk/pubns/priced/l121.pdf (accessed 10/02/2025)
3. .Public Health England (2020) Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment 2nd Edition. Available at: https://www.rqia.org.uk/RQIA/files/44/449bdd1c-ccb0-4322-b0df-616a0de88fe4.pdf (accessed 10/02/2025)
4. The Ionising Radiation (Medical Exposure) Regulations (2017) Available at: https://www.legislation.gov.uk/uksi/2017/1075/pdfs/uksi_20171075_en.pdf (accessed 10/02/2025)
5. International Commission on Radiological Protection publication 103 (2007) Recommendations of the International Commission on Radiological Protection . Available at: https://www.icrp.org/docs/ICRP_Publication_103-Annals_of_the_ICRP_37(2-4)-Free_extract.pdf (accessed 10/02/2025)
6. Faculty of General Dental Practitioners UK (2018) *Selection Criteria for Dental Radiography*. 3rd Edn. London. College of Dentistry. https://cgdent.uk/selection-criteria-for-dental-radiography/ (accessed 10/02/2025)