FDI POLICY STATEMENT

Radiation Safety in Dentistry

Revised version adopted by the General Assembly: 2026, Prague, Czech Republic.
Original version adopted by the FDI General Assembly: 2014, New Delhi, India

CONTEXT

Dental radiology is a discipline that has undergone significant changes. This is intrinsically linked to digitalization and the emergence of new systems, such as Cone Beam Computed Tomography (CBCT), along with the indications for their use. Given the risks of exposure to ionizing radiation and its cumulative effects, it is important to review the rules governing radiation safety in dentistry and apply methods to reduce radiation exposure while maintaining diagnostic image quality

SCOPE

This policy statement provides a foundation for the fundamental concepts in radiation protection that dental professionals and their teams need to understand for their diagnostic clinical practice, including radiation levels based on the equipment used, indications, and protective measures for patients.

DEFINITIONS[1]

Effective dose. It is the tissue-weighted sum of the equivalent doses in all specified tissues and organs of the human body. It is expressed in millisieverts (mSv).

Radiation risk. The potential harm posed by exposure to radiation. In risk assessment, risk is a combination of the probability of damage or injury occurring and its severity.

Radiation protection. The protection of individuals against the harmful effects of exposure to ionizing radiation and the means used to achieve such protection.

PRINCIPLES

The basic principles of regulations on radiation safety in dentistry include:

Justification. The process of determining whether the benefit of an exposure outweighs the risk. The radiograph should be obtained when a patient is likely to benefit from diagnostic imaging, and the benefit outweighs the risk of ionizing radiation exposure. An initial clinical examination is required to determine the need and type of images necessary for evidence-based diagnosis and treatment planning[2].

Optimization. The likelihood of exposure and the magnitude of individual doses should be kept as low as reasonably achievable (ALARA), applying the ALADAIP principle (As Low As Diagnostically Achievable, Indication-oriented and Patient-specific) to ensure the resulting image is of acceptable diagnostic quality for the clinical indication. [1].

Dose limitation. The restriction of radiation doses to individuals to prevent deterministic effects and limit stochastic effects. Exposure should not exceed the dose limits recommended by the International Commission on Radiological Protection (ICRP) and/or national and international regulations[3] over a specific period. In dental radiology, dose limits are applicable to occupationally exposed workers and members of the public, whereas the protection of patients is achieved through the principles of justification and optimization, utilizing Diagnostic Reference Levels (DRLs) as an optimization tool.

POLICY

In the context of radiological safety in dentistry and minimizing radiation exposure, the FDI recommends implementing the following measures[4]:

- **Image receptor.** Using digital image receptors or high-speed films (E or F speed) substantially reduces the radiation dose needed to acquire the image. D-speed films should not be utilized for intraoral imaging. An image receptor holder should be used to position the image receptor in the patient's mouth.
- **Beam collimator.** The X-ray beam should be collimated to the area of clinical interest. For intraoral radiography, rectangular collimation should be used whenever possible. If this is not feasible, the beam diameter should be limited to 6–7 cm or less.
- **Exposure Parameters.** For intraoral radiographs, preferably use 60–70 kVp (kilovoltage peak*)* to optimize contrast and reduce depth dose. Reduce exposure time and/or mA when applicable. Use machines with automatic exposure controls when available. If not, use technique charts or other appropriate means to minimize over or underexposures. Particular attention, supported by a thorough risk assessment, should be paid to children, pregnant patients, medically complex individuals, and patients requiring repeated imaging, as cumulative exposure risk may be greater. Necessary radiographs should not be withheld from these populations when clinically justified.
- **Operator Protection.** Operators should remain outside the path of the primary beam and stand at least two meters from the radiation source and/or behind a protective shielded barrier whenever possible. Personal dosimetry is recommended to monitor occupational exposure.
- **Hand-held units.** Such units should be stored in a locked facility when not in use to prevent unauthorized access. The unit should be equipped with a backscatter shield, and, depending on the radiation risk analysis, personal radiation dose monitoring is recommended. Where feasible, a fixed-mounted unit with remote exposure control is preferred[4]. Equipment should meet the same shielding, filtration, cone length, and exposure parameter specifications as those required for fixed intraoral radiographic units.[5]
- **CBCT.** When indicated and when lower-dose (two-dimensional) imaging techniques are insufficient for clinical diagnosis, use the smallest field of view and

dose-minimizing procedures guided by official and established benchmarks or guidelines. CBCT examinations should not be used routinely or for screening *and* require specific protocols and adequate training for both operators and referrers. Tomographic volumes may require interpretation by suitably qualified and appropriately trained professionals.

- **Patient shielding**. Radioprotective shields generally include using rectangular collimation, digital image receptors, proper radiographic techniques, and maintaining equipment quality control. However, if all these standards are not met or if a patient has specific medical needs, the use of shields is advisable. The transition away from routine patient shielding is grounded in optimization principles and evidence-based practice. Its clinical implementation should be accompanied by clear, consistent communication strategies by national authorities and professional associations to maintain public confidence and align with local regulatory frameworks. Clear communication with patients regarding the rationale for shielding decisions should be encouraged to maintain trust and understanding.
- **Quality control.** Protocols should be developed and followed to assess the integrity of the radiation generator, image processing device, and system. Follow the manufacturer's documentation for safe and proper operation, maintenance, and infection control. It is recommended that an expert be involved in dose assessment, protocol selection, and quality assurance. Where feasible, periodic audit of radiographic practice, including in mobile and community outreach settings, together with documentation of accidental or unintended exposures, may be considered as a quality-improvement tool.
- **Education and training.** People operating radiation devices, including dentists and other oral health professionals authorized by national regulation, must have appropriate and continuous training, education, and certification.

KEYWORDS
CBCT, Dental radiograph, Radiation, Safety.

DISCLAIMER
The information in this Policy Statement was based on the best scientific evidence available at the time. Implementation should be adapted to local cultural, socioeconomic, and resource contexts. Measures described as recommended may be mandatory under applicable national, regional, or international regulations, which should always take precedence.

REFERENCES

1. **International Commission on Radiological Protection (ICRP). ICRP Glossary [Internet]. Available from:** https://icrpaedia.org/ICRP_Glossary [Accessed 15 December 2025].
2. Benavides E, Krecioch JR, Connolly RT, Allareddy T, Buchanan A, Spelic D, O'Brien KK, Keels MA, Mascarenhas AK, Duong ML, Aerne-Bowe MJ, Ziegler KM, Lipman RD. Optimizing radiation safety in dentistry: clinical recommendations and regulatory considerations. *J Am Dent Assoc.* 2024;155(4):280–93.

3. International Atomic Energy Agency (IAEA). *Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards.* IAEA Safety Standards Series No. GSR Part 3. Vienna: IAEA; 2014.
4. International Commission on Radiological Protection (ICRP). *The 2007 Recommendations of the International Commission on Radiological Protection.* ICRP Publication 103. Ann ICRP 2007;37(2–4):1–332.
5. Berkhout WER, Suomalainen A, Brüllmann D, Jacobs R, Horner K, Stamataki HC. Justification and good practice using handheld portable dental X-ray equipment: a position paper prepared by the European Academy of DentoMaxilloFacial Radiology (EADMFR). *Dentomaxillofac Radiol.* 2015; 44.