

Inside the Radiology and Radiotherapy Departments

What happens in these departments?

Radiology acquires images for diagnosis and image-guided procedures. Modalities include radiography, fluoroscopy, ultrasound, CT, MRI, and nuclear medicine (SPECT/PET).

Radiotherapy delivers ionizing radiation to treat cancer with linear accelerators, brachytherapy, or proton therapy.

In France, practices are framed by national guidance from HAS [1] and ASNR [2], and professional societies such as SFRO [3].

Operation flow

Radiology. Referral and justification; verification of identity, consent, pregnancy status, allergies and renal risk; modality-specific preparation; imaging; preliminary check of image quality; teleradiology; report and structured communication to the prescriber; archiving in PACS [1, 4].

Radiotherapy. Consultation; CT simulation with immobilization and image registration; target and organ-at-risk contouring; treatment planning in TPS; independent dose checks and machine QA; patient-specific QA; treatment delivery with image guidance (IGRT) and motion management; follow-up and toxicity recording [2, 3].

Core equipment

Radiology:

- X-ray rooms with digital detectors; mobile radiography.
- Fluoroscopy and angiography suites with flat-panel detectors and dose monitoring.
- Ultrasound systems with Doppler and interventional probes.
- CT scanners with automatic exposure control and dose index reporting.
- MRI systems with gradients, coils, and safety controls (screening, SAR monitoring).
- Breast imaging: digital mammography, tomosynthesis, stereotactic biopsy.
- Nuclear medicine: SPECT/CT, PET/CT (or PET/MR), radiopharmacy hot lab.

Radiotherapy:

- CT simulator; optional MRI and PET for fusion.
- Treatment Planning System (TPS) with dose calculation algorithms; contouring and deformable registration.
- Linear accelerators with MLCs, on-board kV imaging, CBCT, surface guidance; optional electrons, VMAT/IMRT, stereotactic capabilities.

- Brachytherapy afterloader and treatment planning; applicators and QA phantoms.
- Proton therapy: cyclotron/synchrotron, beam delivery, range verification (centers spécialisés).
- Dosimetry: ion chambers, electrometers, film/EPID, phantoms for commissioning and patient-specific QA.

Digital systems around radiology and radiotherapy

Radiology. RIS for scheduling and reporting, PACS/VNA for image storage and sharing, dose management systems for DR/CT/fluoro, structured reporting templates, and secure data exchange with the *Dossier Médical Partagé / Mon Espace Santé*.

Radiotherapy. Oncology information system (OIS) linking simulation, contouring, planning, delivery, and follow-up; profiles for interoperability [5].

Team and safety culture

This is a multidisciplinary work, with radiologists, radiographers/manipulateurs, medical physicists, radiation oncologists, dosimetrists, nurses, anesthesiologists, and biomedical engineers. There are standardized checklists, time-outs, MRI zoning, contrast reaction drills, and systematic morbidity/toxicity documentation reduce risk and variation [1, 3].

References

- [1] Haute Autorité de Santé (HAS). *Check-list «Sécurité du patient en radiologie interventionnelle»*. https://www.has-sante.fr/upload/docs/application/pdf/2011-07/check-list_securite_radiologie_interventionnelle.pdf.
- [2] Autorité de sûreté nucléaire et de radioprotection (ASNR). *Principales dispositions réglementaires de radioprotection applicables en radiologie médicale et dentaire*. <https://reglementation-controle.asnr.fr/reglementation/guides-de-l-asnr/principales-dispositions-reglementaires-de-radioprotection-applicables-en-radiologie-medicale-et-dentaire>.
- [3] Société Française de Radiothérapie Oncologique (SFRO), Société Française de Physique Médicale (SFFPM). *Guide des procédures de radiothérapie externe*. https://recherche-expertise.asnr.fr/sites/default/files/documents/professionnels_sante/documentation/guide_procedures_radioth%C3%A9rapie_externe.pdf.
- [4] Haute Autorité de Santé (HAS). *Qualité et sécurité des actes de téléimagerie – Guide de bonnes pratiques*. https://www.has-sante.fr/upload/docs/application/pdf/2019-07/guide_teleimagerie.pdf.
- [5] Integrating the Healthcare Enterprise (IHE). *IHE Radiation Oncology (RO) Technical Framework*. https://www.ihe.net/uploadedFiles/Documents/Radiation_Oncology/IHE_RO_TF_Vol1.pdf.