Radiophysics and Radioprotection

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DESCRIPTION

The Radiation Physics and Radiation Protection research group conducts applied research in three fields of ionising radiation application in medicine: radiation therapy, nuclear medicine, and radiology. This research is intended to solve gaps in knowledge in the safe application of radiation in medicine due to new technology, new techniques, new procedures or the application of new legislation.

MAIN LINES OF RESEARCH

- Artificial Intelligence applied to radiotherapy DVH prediction and radiotherapy treatment plan optimization. (Gallego Franco, Pedro; Pérez-Alija Fernández, Jaime; Tejedor Aguilar, Natalia).
- Clinical Audits in Radiotherapy. Line shared with the Radiation Oncology department. (Jornet Sala, Nuria).
- Standardization in Nuclear Medicine. (Ruiz Martínez, Agustín; Barcelo Pages, Marta).
- Diagnostic Reference Levels (DRL) by means of a radiation dose management solution. (Barcelo Pages, Marta; Ruiz Martínez, Agustín).
- Biological Dosimetry. (Carrasco De Fez, Pablo; Pérez-Alija Fernández, Jaime).
- Clinical transmission EPID-based in vivo dosimetry. At present, we have an agreement with Sun Nuclear Co. to clinically implement and suggest improvements on the

SunCHECK® quality assurance platform in radiotherapy, which includes treatment unit quality assurance and patient-related quality assurance, including PerFraction® software, used for in vivo dosimetry with the electronic portal device of linear accelerators. (Anson Marcos, Cristina; Jornet Sala, Nuria).

SCIENTIFIC CHALLENGES

- To make radiotherapy treatment planning less person-dependent, to decrease variability and optimise treatment plans.
- To define a strategy to perform clinical audits in radiotherapy at a regional level that could be escalated to the national and international levels.
- To set up clinical audits in radiotherapy in Catalonia.
- To standardise quantitatively image acquisition in PET and SPECT imaging.
- To get all imaging modalities integrated in the dose management system provided by the Catalan government, and to derive DRLs values for all the equipment at HSCSP.
- To manage DRLs and compare them against regional, national and international values.
- To update the dose-biological effect calibration curve, relating chromosomal aberrations to radiation absorbed dose, based on modern automatic systems.
- To derive an easy test to classify irradiated individuals from a potential accident into those that would require exceptional follow-up and treatment, and those that were exposed to non-critical doses.
- To derive clinically relevant tolerance actions for EPID-based in vivo dosimetry on each anatomical treatment site in radiation therapy.
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- ACTIVE & AWARDED GRANTS
- Jornet Sala, Nuria & Sancho Pardo; Gemma. Catalan Clinical Audit network for Quality Improvement in RT [CAT-ClinART]. EU4H Action Grants 2023. UE. Duration: 2023-2027. 374.999,92 € (FGS)
- Tejedor Aguilar, Natalia. Desarrollo y evaluación de modelos de inteligencia artificial para predicción de dosis y generación automática de planes clínicos para tratamientos de mama con IMRT. SEFM 2023. Duration: 2023-2025. 2.000,00 €

SCIENTIFIC PRODUCTION

- Balcaza VG, Barceló Pagès M, Ruiz Martínez A, Campa A, Ginjaume M, Ducha MA. Comparison of experimental measurements and fast Monte Carlo simulations for typical set-ups in fluoroscopically-guided interventional procedures. RADIATION MEASUREMENTS. 2024; 175:107146. DOI:10.1016/j.radmeas.2024.107146. IF:1,600 (Q2/4D). Document type: Article.
- Beveridge S, Alves A, Hussein M, Clark CH, Jornet N, Viegas CCB, Reniers B, Álvarez PE, Azangwe G, Chelminski K, Dimitriadis A, Kazantsev P, Swamidas J. An international film dosimetry intercomparison to establish a multi-center audit framework. MEDICAL PHYSICS. 2024; 51(12). DOI:10.1002/mp.17428. PMID:39316455. IF:3,200 (Q1/3D). Document type: Article.
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