PS10.11
IOT WEREABLE MONITOR (PM 2,5 – PM 10)

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This work presents a low-cost wearable monitor for measuring PM2.5 and PM10 particulate matter concentrations. The monitor employs a laser particle counter interfaced with an Arduino platform, incorporating an Internet of Things (IoT) approach. Data are sampled at a regular rate, stored on a smartphone or in the cloud for post-acquisition processing and graphical visualization, and can eventually notify the user when predetermined values are reached.
The wearable design enables monitoring of human exposure to particulate pollution across various locations and times. The system supports the integration of location data from a GPS sensor into a GIS database for spatial analysis. The devices are battery-powered and can be worn or utilized as fixed probes, with the potential for power supply via solar panels and/or wind generators.
Machine Learning techniques are employed to improve accuracy by comparing data from proximal sensors. The collected data can also be utilized for training predictive models leveraging Deep Learning techniques. During monitoring, concentration values are wirelessly transmitted to the cloud, supporting the use of the MQTT IoT protocol. The monitor can sample other environmental parameters, enabling full monitoring of air quality and exposure levels in both outdoor and indoor environments.
The construction of the dust sensors and data collected from this research enhance the current research by describing an open-source concept and providing initial measurements. In principle, sensors can be massively multiplexed and used to generate real-time maps of particulate matter around a given location.
Keywords: Arduino; IoT; air quality; crowd-sensing; crowd-sourced sensing; dust sensor; environmental analysis; human exposure; particulate matter; pollution; wireless networks.

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PS10.12
EVOLUTION OF FRICKE GEL DOSIMETRY FOR ENHANCED RADIOTHERAPY QUALITY ASSURANCE

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Introduction: The Fricke Xylenol Gel (FXG) is a radiochromic dosimeter of great interest in the medical field due to its properties that resemble those of human tissue. Its response is based on the radio-induced conversion of ferrous ions to ferric ions. Despite its potential, the use of this dosimeter still faces significant challenges, particularly regarding the control of auto-oxidation. This work aims to review the advancements and techniques used to enable the effective application of this dosimeter in quality control for radiotherapy treatments.
Materials & Methods: The results were obtained through a literature review that investigated the main advancements and methodologies employed, resulting in the enhancement of the Fricke Xylenol Gel dosimeter for applications in radiotherapy dosimetry
Results: The findings unveiled noteworthy progress in utilizing Fricke Xylenol Gel dosimetry for radiotherapy applications. These advancements arise from proposed modifications regarding the dosimeter's primary reagents, coupled with techniques enabling precise control over natural oxidation and ferrous ion diffusion.
Summary: In summary, the advancements in Fricke Xylenol Gel dosimetry demonstrate its increasing suitability for radiotherapy applications. The proposed modifications and refined techniques for controlling oxidation and ion diffusion signify significant progress in enhancing dosimeter efficacy. These findings underscore the importance of ongoing research to optimize dosimeter performance, ensuring improved quality assurance in radiotherapy treatments.
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PS10.13
ASSESSMENT OF DOSIMETRY IN ONCOLOGICAL TREATMENT USING RADIOACTIVE NANOPARTICLES: A COMPREHENSIVE LITERATURE REVIEW

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Introduction: With technological advances in medicine, various treatments and diagnoses have emerged, contributing to extended survival for cancer patients. In the ever-evolving landscape of nanotechnology and medicine, radioactive nanoparticles emerge as promising agents at the interface of diagnosis and therapy, offering innovative applications in the field of theranostic medicine capable of integrating both diagnosis and therapy in a single device. With this purpose, this study aims to conduct a literature review on the dosimetry of radioactive nanoparticles, intending to evaluate their feasibility for oncological treatment.
Materials & Methods: The bibliographic study exclusively focuses on works related to the dosimetry of radioactive nanoparticles. The selection involved relevant topics on the Scopus platform (Elsevier), such as dosimetry, in vivo tests, and preclinical studies involving radioactive nanoparticles.
Results: Out of 113 selected works, 51, 24, and 38 address dosimetry, in vivo tests, and preclinical studies of radioactive nanoparticles, respectively. Due to the scarcity of research, all articles were analyzed, excluding those less cited and less relevant to the objective. Most studies suggest viability as a treatment, although some do not detail the dose calculation in the target region.
Summary: This work provides studies on the dosimetry of radioactive nanoparticles, highlighting a broad distribution of research. While the treatment shows promising viability, gaps persist, especially in describing the precise calculation of the dose in the target region, pointing to opportunities for future research to address this issue.

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PS10.14
ESTABLISHMENT OF DIAGNOSTIC REFERENCE LEVELS (DRLs) FOR DENTAL INTRAORAL RADIOLOGY AT CUF HOSPITALS & CLINICS, PORTUGAL

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Introduction: The establishment of DRLs is recommended as a way to implement the optimization of patient protection and promote best clinical practices. This study was aimed at auditing doses in dental practice and establishing local DRLs for intraoral radiology examinations based on clinical indications, at CUF Hospitals & Clinics, Portugal.
Materials and Methods: The sample included referrals for various clinical indications: cavity lesion (I1), endodontic (I2), surgical (I3), periodontal (I4) and implants diagnosis and treatment (I5), diagnosis of cystic lesions (I6), fixed rehabilitations (I7), restorations (I8) and occlusal trauma (I9) assessments.
DRLs were assessed in terms of incident air kerma (K_a) and kerma area product (P_{KA}). K_a were measured using a calibrated Raysafe X2-R/F dosimeter. The obtained K_a was multiplied with the beam area to evaluate P_{KA}. The sample included 1500 justified clinical indications performed in 25 intraoral X-ray devices from 6 sites.
Results: The median K_a and P_{KA} were obtained for each clinical indication and site. The third quartile values calculated from the median of each site for adult, ranged from 0,7 mGy up to 1,5 mGy, for the investigated clinical indications. The P_{KA} varied from 7,4 mGycm^2 for I9 up to 23,6 mGycm^2 for I7.
Summary: In the group of dental clinics where the study was performed the dose indicators obtained are in line with the international DRLs established. Further analysis can be performed analysing the dental group of teeth exposed. This study lays foundations for the establishment of national DRLs in Portugal.

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PS10.15
PRECAUTIONS FOR RADIATION WASTE MANAGEMENT IN MEDICAL CYCLOTRON

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Introduction: This work is focused on managing the radiation waste that is produced during the production of radiopharmaceuticals using a cyclotron.
Materials and Methods: In the cyclotron centre of Pharmazac, a PETtrace 800 (GE) cyclotron having dual photon beam and max beam current 160 μA, two types of waste were considered: Solid waste produced from cyclotron maintenance (Havar foil, target body, target carousal, carbon body etc) and liquid from the FDG synthesis. To assess safety precautions the half life of the radionuclide have been taken into account.
Results: Long lived solid waste like - Havar foil, target body and carousal, carbon foils and others - have long lived radionuclides due to neutron irradiation. Dedicated 10 cm Pb container located inside the cyclotron vault, is used for storage these parts where they will remain up to decommissioning of cyclotron, that is in 20-30 years.
Short lived sold waste (cassettes, tubes, needles, syringes, catridges etc) are generated during radiopharmaceutical synthesis and regular radiochemistry operations. These are kept within the hot cells for 18-20 hours and then in waste storage room to be disposed as regular waste.
Short lived liquid waste is produced during synthesis, collected within the hot cell and disposed after complete decay. Enriched water is used for irradiation process ^{18}O [H_2O] which is stored and returned to manufacturer for recycling.
Summary: During the industrial process of medical cyclotron effective management of radioactive materials requires careful planning and implementation of procedures to ensure safety and costs elimination.

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PS10.16
ACTIVITY IN THE SALIVA OF rhTSH AND THW THYROID CANCER PATIENTS TREATED WITH IODINE-131

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Purpose: To quantify the reliability and accuracy of SGRT in positioning extremity patients compared to conventional methods.
Secondary objectives include investigating improvement of workflow efficiency, reducing number of CBCT and repeat positioning with SGRT.
Method: *30 patients treated for extremities and* immobilised with vacuum bags, Moldcare, polystyrene or excluding immobilisation *were analysed retrospectively (Group A).* For daily positioning AlignRT software was used.
Another 30 patients were treated using traditional setup (lasers and skin marks): 15 were immobilised with thermoplastic masks (Group B) while the other 15 patients were immobilised with other devices (Group C)
Data collected included percentages of translational distribution shifts-based surface shifts versus CBCT shifts, *setup timing and systematic and random translational setup errors*
Results:
- AlignRT setup for extremity patients is more precise than conventional setup.