

fact were changed by a position of the X-ray tube. However, according to new moving phantom, the motion artifacts of the on-center and off-center were possible to evaluate in same X-ray tube position. The artifact of the off-center became bigger than on-center of the FOV.

Conclusion: We evaluated spatial resolution and motion artifacts off-center of the FOV. We found that spatial resolution decreased and motion artifacts increased when moving out of the center of the FOV. The results of this experiment showed that it was important to center the subject in her FOV when performing cardiac CT examinations. With the CT table lateral movement mechanism, these problems can be solved and good cardiac images can be obtained.

Keywords: CT, Off-center of FOV, Spatial resolution, Motion artifact, Phantom

Estimation of Occupational Eye Lens Dose in Nuclear Medicine:

A Monte Carlo Study

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Introduction: The radiation workers in nuclear medicine are involved with unsealed radioactive source. The measurement of eye lens dose using dosimeter could lead to significant error and uncertainties. Therefore, this study aims to estimate the eye lens dose of the radiation workers in nuclear medicine using Monte Carlo (MC) simulation.

Methods: In this work, MC simulations were performed using MCNP5. The measured Hp(3) using NanoDotTM in cylindrical phantom with ⁶⁰Co and ¹³⁷Cs standard sources were conducted to validate MCNP code. Additionally, the simulated air kerma rate constants have been validated using commonly used radionuclides including ¹⁸F, ^{99m}Tc and ¹³¹I. Then, the validated MCNP code was used to estimate the eye lens at distance of 10 to 50 cm from eye level of PIMAL phantom.

Results: The percentage error of experimental and simulation results were less than the acceptance limit of 10% for code validation. Then, the clinical source geometries were simulated e.g., 3 mL solution in the 5-mL syringe for ¹⁸F, 1 mL solution in the 3-mL syringe for ^{99m}Tc and the capsule in the 10-mL vial for ¹³¹I. The eye lens doses were increased when the energy of emitted photon increased. Subsequently, ¹⁸F provided highest eye lens dose followed by ¹³¹I and ^{99m}Tc. At 10 cm, the eye lens dose rates were 20.55, 7.90 and 2.33 μ Sv/MBq/hr for ¹⁸F, ¹³¹I and ^{99m}Tc respectively. The eye lens dose rates were decreased when the distance increased as expected. At 50 cm, the eye lens dose rates were dramatically dropped to 1.16, 0.46 and 0.14 μ Sv/MBq/hr for ¹⁸F, ¹³¹I and ^{99m}Tc respectively.

Conclusion: The eye lens dose rates from commonly source geometries and distances were simulated in this work. The values could be used as a caution limit to ensure that no individual is committed to unacceptable risk due to radiation exposure.

Keywords: eye lens dose, occupational exposure, Monte Carlo simulation, radiation protection

A study on changes in exposure dose through development of bismuth shielding during pediatric X-ray examination

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Introduction: Pediatric patients are more sensitive to radiation than adults, dose reduction through appropriate shielding is necessary. In this study, an acrylic shielding board was manufactured from bismuth, which is lightweight, has excellent dose reduction effect, and researched to investigate what kind of effect it has on radiation exposure reduction.

Methods: Dosimeters were installed at 4 radiosensitive sites: eye, thyroid, breast, and gonad. After that, the dose was measured before and after using the bismuth shielding board. We used SAMSUNG AccE GC85A DR, a human body model phantom and RaySafe's Unfors PSD (Patient Skin Dosimeter) for dose measurement. The shielding board is made of acrylic with Bismuth RAD-PAD[®]5300 and 5511. Dose was measured 10 times before and after applying the shielding board to the head, chest and abdomen. The results were analyzed using SPSS Ver.27.

Results: In the pediatric head technical factors, the average values before and after application of the bismuth shielding board were changed from 319.92 μ Sv to 100.53 μ Sv for the eyeball, from 763.63 μ Sv to 207.08 μ Sv for the thyroid, from 15.19 μ Sv to 2.4 μ Sv for the breast, from 3.58 μ Sv to 0.99 μ Sv for the gonad. In the pediatric chest technical factors, it changed from 7.6 μ Sv to 6.1 μ Sv for the eyeball, from 67.2 μ Sv to 28.9 μ Sv for the thyroid, from 202.2 μ Sv to 199.7 μ Sv for the breast, from 6.48 μ Sv to 6.44 μ Sv for the gonad. In the pediatric abdominal technical factors, it was changed from 2.53 μ Sv to 2.47 μ Sv for the eyeball, from 5.2 μ Sv to 4.64 μ Sv for the thyroid, from 27.03 μ Sv to 21.67 μ Sv for the breast, from 130.86 μ Sv to 23.52 μ Sv in the gonad.

Conclusion: When the bismuth shielding board was applied, dose reduction was observed at four sites in the pediatric head, chest, and abdomen X-ray. In particular, the highest dose reduction appeared in head using relatively high tube current.

Keywords: Pediatric patients, Radiation Sensitivity, Shielding, Bismuth

Assessment of educational needs and factors influencing the level of digital skills of TR/RTTs - a stakeholder perception

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Introduction: In an era of healthcare digitalisation, a high level of digital skills in the professional practice of Therapeutic Radiographers/Radiation Therapists (RT/RTTs) is vital to ensure patient safety and quality of care. This study aimed to assess stakeholders' perceptions regarding the digital skills of TR/RTTs in Radiotherapy (RT).

Methods: Semi-structured focus-groups (n=3-4) and interviews (n=4) were conducted online via Microsoft Teams with Portuguese RT stakeholders (the most represented country in a previous European survey), using an interview

script. Stakeholders (TR/RTTs practitioners, managers, educators, students, professional bodies and software suppliers' representatives) were asked to identify the factors influencing digital skills and suggest ways to improve the less developed skills identified in the previous survey. Interview transcripts were carried out independently and NVivo (v12) was used for thematic analysis.

Results: In total, 16 RT stakeholders were interviewed and a lower level of digital skills was identified amongst TR/RTTs in the dimensions of "Treatment planning" and "Management and Research". The lack of: time dedicated to underdeveloped areas within the degree programme, rotation among the professionals in different areas of RT practice, protected time for research, and education modules related to digital skills, were identified as causative factors. A consensus was found regarding developing emerging skills in computer programming, especially in the context of Artificial intelligence tools development. **Conclusion:** It is necessary to ensure that TR/RTTs develop the essential digital skills that enable them to adopt the best patient care. TR/RTTs' education must provide them with digital skills training, including specific training in software commonly used in RT and research. Some of these skills can also be reinforced through some forms of continuous professional development programmes. Training in AI is essential for future practice. Lastly, TR/RTTs should gain experience in all areas of RT practice.

Keywords: Therapeutic Radiographers, Radiation Therapists, Digitalisation, Skills, Education

DIFFUSION TENSOR IMAGING OF BREAST MRI: A LITERATURE STUDY IN BREAST CANCER

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Introduction: The structure of the breast causes anisotropic diffusion in the breast. Diffusion Tensor Imaging (DTI) is considered more accurate than Diffusion Weighted Imaging (DWI) in providing anisotropic diffusion information. The purpose of this study was to determine the acquisition parameters and the role of DTI in breast MRI examination in clinical breast cancer.

Methods: This study started from the planning stage (problem identification), conducting stage (searching, selecting, extracting, and synthesizing articles), and reporting stage (elaboration of results). Proquest, Google Scholar, Science Direct, Springer and Pubmed databases were searched from February until April 2022 for the studies. Studies were reviewed according to the exclusion and inclusion criteria.

Results: The acquisition parameter setting on the DTI used varies in each article. The sequence used is Echo Planar Imaging (EPI), the magnetic field strength used is 1.5T or 3T, the number of diffusion gradient directions applied varies from 6 to 64, and the b-value used varies from 600 s/mm² to 1000 s/mm². Fractional Anisotropy results in higher scores in malignancy compared to benign lesions. Meanwhile, eigenvalues and mean diffusivity resulted in lower values for malignancy compared to benign lesions.

Conclusion: An optimal setting of DTI acquisition parameters is required to produce accurate diagnostic information. DTI is considered to have a role in differentiating malignancy from benign lesions which was proved by the significant difference values between malignancy and benign lesions.

Keywords: Breast Cancer, Breast Imaging, Diffusion Tensor Imaging, Diffusion Magnetic Resonance Imaging, Cell Differentiation

Diagnostic Reference Level in Coronary Angiography: A Single Healthcare Facility

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Introduction: Diagnostic reference level (DRL) is a useful tool to investigate optimisation of radiation dose. Kerma-area product (PKA) and fluoroscopic time (FT) are two methods used in interventional procedures to evaluate radi-

ation optimization. In Malaysia, there has been limited published research on DRL in interventional procedures. Therefore, the purpose of this study is to compare the dose received by patients during coronary angiography (CA), to Ministry of Health-established DRLs and those reported in the literature. The relationship between PKA and FT; and PKA and body mass index (BMI) were evaluated as well.

Methods: In this retrospective study, 197 patients who underwent CA were randomly collected from Clinical Information System (CIS). The study included adult patients aged 30 and above who had CA-only between April 2021 and April 2022. The radiation dose was defined by the median (interquartile range). The correlations between PKA with FT; and PKA with the patient's BMI were tested using Spearman's rho correlation.

Results: The median of PKA and FT for CA procedures were reported as 19.14 Gy.cm² (range: 6.35-471.1 Gy.cm²) and 1.80 min (range 0.6-88.7 min) respectively. The acquired PKA for CA was higher than the established DRL of the Malaysian MOH, 5.4 '10⁻⁷ Gy.cm². However, the acquired DRL for CA was the lowest when compared to published literature. Spearman's rho revealed that there was significant correlation ($p < 0.001$) between the two pairs of variables mentioned above.

Conclusion: The DRL in this study did not adhere to the established DRLs. Moreover, it was found that BMI and FT can be a predictor to higher PKA.

Keywords: CA, DRL, PKA, FT, Ministry of Health

Reflection on the transdisciplinary approach involving students in educating communities about COVID-19

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Introduction: The disruption brought about by the COVID-19 pandemic to higher education teaching and learning, as well as to the community engagement opportunities, has also brought about some new learning opportunities. The purpose of the research was to explore the views and to describe their thoughts of the School of Healthcare Sciences (SoHCS) and the Faculty of Engineering, Built Environment and Information Technology (EBIT) undergraduate students' on the use of robotics and technology in educating the communities about COVID-19.

Methods: Participatory Action Research (PAR) was used for this study since the students from SoHCS and EBIT were invited to be active participants as future professionals. A total of 27 students volunteered and participated in in-depth interviews. The responses were analysed using ATLAS.ti from nine data sets for qualitative content. Data reduction, coding, and decoding analytic processes were used to analyse and interpret each of these qualitative data forms. Ethical approval was obtained from the research ethics committees in the Faculty of Health Sciences as well as the Faculty of Engineering, Built Environment and Information Technology.

Results: Five themes that emerged from this study are namely: COVID-19 and community challenges and behaviour; COVID-19 communication; COVID-19 knowledge and understanding; COVID-19 myths and COVID-19 robotics and technology education.

Conclusion: COVID-19 has proven to be a driver of technology innovation and can create new high-touch and high-quality services. Using information technology and robotics in health sciences or in community engagement projects would minimize the exposure of health care workers and members of the communities to possible infections. These findings also reflect on the im-