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SAFETY REGULATIONS FOR OPERATING PROCEDURES WITH UNSEALED RADIONUCLIDES

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The Hungarian radiation protection regulatory system is quite complete at the level of act, ministerial and governmental orders, standards, but at the lower level namely the set of operational guidance, safety regulation, is deficient. The basic safety standards for the application of ionizing radiations are found in the Decree No. 16/2000 (VI. 8.) EüM of the Minister of Health, while the recently revised MSZ 62-7 standard contains the information on how to design radiation safety of radioisotope laboratories, at the same time there is no guidance on what is considered as good practice working with radioactive materials. In the seventies and eighties the effectively used radioisotope and X-ray safety guides described good practice but these had became invalidated, and not considering some paragraphs of the Decree No.16/2000. (VI.8.) there are no safety guides which would have replaced these. The aim of the presentation is to raise attention, to the safety regulations for operating procedures with unsealed radionuclides and to review its aims, scope of applicability and delineate its general contents. The main goal of the safety guide is to become "The guide of good practice for working with unsealed radioactive sources", intended to be used by those who work at radioisotope laboratories, primarily at nuclear medicine departments. The first version of the document was developed with the support of the HAEA (Hungarian Atomic Energy Authority) (OAH ÁNI/ABA 01/09).
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RADIATION PROTECTION OF PERSONNEL WORKING IN A NUCLEAR MEDICINE DEPARTMENT

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Background: The aim of this study was to identify the factors having a significant influence on the measured radiation doses, including the scope of activity and individual style of work, by processing the personal dosimetry data of an institute with extensive "*in vivo*" nuclear medicine profile. We compared the data of film and digital dosimeters in cases of radionuclides with different gamma energies, and tested the effect of using automatic FDG infusion system on the staff dose.
Material and methods: The exposure of personnel was measured by film dosimeters evaluated by the National Personal Dosimetry Service, and Thermo Scientific EPD Mk2+ digital personal dosimeters read out locally. Exposure data measured by film dosimeters were collected over a 10 years' period in three divisions, including gamma camera imaging and PET. 27 persons were enrolled in this study. Inactive periods and end of employment were noted. A total of 950 film dosimetry and 75 digital dosimetry data were analyzed. We classified film dosimetry data into 9 categories by the scope of activity. Digital dosimeters were utilized by PET/CT personnel (13 people) and in gamma camera hot lab (1 person). Since film data refer to 2 months' periods, digital dosimetry data were summarized for 2 month intervals as well. The normality of the distribution of data groups was checked by Shapiro-Wilk test. Because of the lack of normality, non-parametric tests were used to compare the groups: Mann-Whitney for two groups, and Kruskal-Wallis test for several groups. Since the differences between film and digital readings showed Gaussian distribution, Student's paired t-test was used for their comparison. The significance of various factors was tested using the general linear model.
Results: 85% of the doses were under 0.6 mSv/2 months. No significant difference was found between data obtained by film and digital dosimetry. However, there was a significant difference between the doses of personnel having different scopes of activity (Kruskal-Wallis test: $p < 0.0001$). The highest doses were measured in the PET/CT department and the hot lab. Using the automatic infusion system significantly reduced the doses: digital dosimetry data showed an average reduction of the effective doses by 0.16 μSv/h (2 sample t-test, $p = 0.008$). Exposures of people doing the same job showed high variances.
Conclusion: Our results suggest that the rotation of the staff between working places is justified to equalize radiation exposure. The individual variances of exposure point out the importance of regular theoretical and practical education, and the skilled usage of radiation protection devices available.

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AUTOMATED MONITORING OF THE MINIPET-II SMALL ANIMAL PET SCANNER OPERATION PARAMETERS

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Background: The MiniPET-II small animal PET scanner was proved to be a useful tool in many biological projects, which require high level of availability. Thus the system requires systematic hardware and software monitoring, rapid identification and replacement of defective components. Furthermore we perform methodological developments, thus the MiniPET-II software system changes constantly. Our aim was to work out an effective automated monitoring system on daily basis to check the operating parameters and to send messages (SMS and e-mail) in case of failure.
Material and methods: The development of system was performed by using MultiModal Medical Imaging software framework developed in our institute. The monitoring software performs automated control of the detectors, the data acquisition and network infrastructure, and the image reconstruction and archiving pipelines. The evaluated system parameters are stored in a technical database available for technical material on www.minipetct.hu. In case of error the software sends message to the authorized personnel of the scanner via SMS and e-mail. The backup storage devices and automated error reporting system allow for quick troubleshooting and high availability.
Results: We developed an automated monitoring system supported by a database, which is able to determine the technical status of the MiniPET-II, thus increasing system reliability. The software monitors the operation of the detector (signal processing electronics, FPGA code), the data acquisition system, network communications (network switch elements, data collection server, data acquisition program, disk capacity, archiving system), the reconstruction pipeline (server restoration, reconstruction software, image quality) and the operating environments (temperature of labs and servers, humidity rate and air pressure of the lab), as well.
Conclusion: The designed infrastructure and the developed monitoring system decreased the measurement failures of MiniPET-II scanner during clinical research projects and provided high availability (higher then 95%).

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SEMIQUANTIFICATION OF MYOCARDIAL PERFUSION AND ECG-GATED SCINTIGRAMS USING TWO SOFTWARE PACKAGES.

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Background: The aim of this study was to compare the diagnostic value of ischemia, wall thickening and wall motion of the Corridor4DM (4DM) and Cedars-Sinai (QPS,QGS) software packages for semiquantification of myocardial perfusion (MPS) and EKG-gated (MGS) scintigrams.
Material and methods: we studied 123 (52 males with a mean age of 62.9 years, 71 females with a mean age of 61.4 years) consecutive patients who underwent two-day stress/rest (99m)Tc-tetrofosmin MPS and MGS studies. All patients had pharmacological stess-test with Dipyridamole. The reference classification for MPS and MGS studies regarding presence or absence