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ASSESSMENT AND OPTIMISATION OF
STAFF RADIATION EXPOSURE IN NUCLEAR
MEDICINE AT VILNIUS UNIVERSITY
HOSPITAL SANTARISKIU KLINIKOS

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PURPOSE AND INTRODUCTION

Introduction: The assessment of occupational exposure in Nuclear Medicine (NM) is constant and mandatory process.

Radiation protection safety culture, quality control and assurance programme, different protective means, automated infusion systems, were implemented in NM department.

Purpose: To assess external and internal exposure doses of NM workers during SPECT and PET/CT procedures.

MATERIALS AND METHODS

- The study was performed at NM department of Vilnius University Hospital Santariskiu Klinikos during 2008 – 2015;

EQUIPMENT FOR EXTERNAL EXPOSURE MEASUREMENTS

- For the whole body measurements was used TLD Hp(10);
- For extremity measurements was used TLD Hp(0.07);
- For estimation of occupational radiation dose in PET/CT were used personal electronic dosimeters (POLIMASTER PM1610B-01).



EQUIPMENT FOR INTERNAL EXPOSURE MEASUREMENTS

- ❑ For internal exposure, whole body detector (HPGe) and thyroid counter (NaI(Tl)) were used;
- ❑ TLD dosimetry and internal exposure services were done at Lithuanian Radiation Protection Centre.



NaI(Tl) thyroid counter



Whole body (HPGe) counter

NUCLEAR MEDICINE FACILITIES

- ❑ GE Infinia (SPECT) – installation 2008
- ❑ GE Hawkeye (SPECT/CT) – installation 2011
- ❑ Swirler nebulizer (Radioaerosol System)
- ❑ Philips Ingenuity TF (PET/CT) – installation 2014
- ❑ IRIDE COMECER radiopharmaceutical dispensing-infusion system – installation 2014
- ❑ ALTHEA COMECER a hot cell with WIS (Wireless Injection System) – installation 2014



RESULTS

- ❑ **402** dose measurements done with TLD for Hp(10);
- ❑ **72** dose measurements done with TLD for Hp(0.07);
- ❑ **59** measurements were performed with (HPGe) and (NaI(Tl)) detectors for internal exposure;
- ❑ **195** measurements were performed by electronic dosimeters (POLIMASTER PM1610B-01) working with PET/CT facilities.

Number of NM procedures from 2011 to 2015 – **7561**

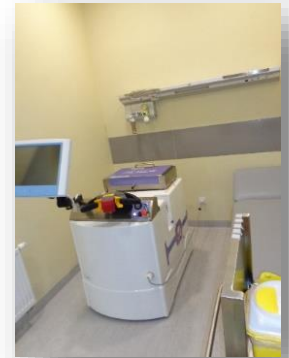
RESULTS OF ANNUAL DOSES

- Annual doses of NM workers in most cases were $< 1\text{mSv}$ for TLD Hp(10);
 - Dose range of one quarter 0,25 – 1,81 mSv
- Annual doses of NM workers for TLD Hp(0.07) was 7,18 mSv;
 - Dose range of one quarter 0,25 – 20,06 mSv
- For internal exposure the highest detected activity of Tc-99m detected was 8245 Bq;
 - 43 times from 59 measured activity were below detectable level

RESULTS OF ESTIMATED DOSES RECEIVED FROM PET/CT PROCEDURES

For PET/CT procedures the estimated median dose received per one patient:

- For medical physicist was $0.29 \pm 0.15 \mu\text{Sv}$;
- For the radiology technologist that worked with ALTHEA system was $1.39 \pm 0.12 \mu\text{Sv}$;
- For the radiology technologist that used IRIDE system was $1.13 \pm 0.32 \mu\text{Sv}$;
- For the radiology technologist who was positioning patients was $0.54 \pm 0.21 \mu\text{Sv}$.



IRIDE system



ALTHEA system with Wireless Injection System

CONCLUSIONS

- ❑ Results of monitoring nuclear medicine workers show that no significant activities were detected. The annual committed effective doses of workers are below 1 mSv;
- ❑ The estimated dose received by the staff from one PET examination working with automatic radiopharmaceutical infusion system was 1.96 μ Sv and working with Hot cell with wireless injection system was 2.22 μ Sv;
- ❑ The estimated dose values do not exceed and are far below dose limits for radiation workers determined by National radiation protection regulations.