ASSESSMENT OF MEDICAL OCCUPATIONAL RADIATION DOSES IN COSTA RICA

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Introduction

- Assessment of doses of medical personnel is an integral part of our national radiation protection program.
- The individual monitoring programme for external radiation exposure of medical staff in the Social Security System is done by the University of Costa Rica (UCR).
- The objectives of this project is to provide national authorities with:
  - Information for optimization of radiation protection actions
  - Demonstrate that the worker`s exposure has not exceeded dose limits
  - Verification of workplace monitoring and radiation protection culture
- The UCR has been in charge of individual monitoring since May 2007; before that time different vendors provided the service in not a very reliable way.
- The UCR has the only laboratory with equipment in the country.

Materials and Methods: Medical Staff monitored

- Social Security System has hospitals and clinics all along the country
- Majority of radiation workers are in the big metropolitan area (Fig 4)
- Distribution of monitored medical personnel is as follows:
  - ✓83% in diagnostic radiology
    (33% radiology and
    67% interventional procedures),
  - ✓6% in nuclear medicine
  - ✓6 % in radiotherapy.
  - Dosimeters are worn at the chest under apron

- Monthly monitoring periods were established by Regulatory Authorities
- Data presented in this study is from the period August 2008 to July 2010.
- Corresponding to 1750 medical workers.

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Materials and Methods: Instrumentation

The instrumentation that the UCR has to measure equivalent dose in medical staff is:

- TLD readers: Harshaw Model 4500 and 6600Plus (Fig.1 and 2)
- TLD card holders: Harshaw Model 8814 with TLD cards: Harshaw Model 21C004 with TLD-100 chips in positions 2 and 3 for Hp(10) and Hp(0.07) respectively (Fig.3)

Additional instrumentation: Sr90/Y90 irradiator, TLD oven and Cs^{137} source

Fig 1: Model 4500

Fig 2: Model 6600 Plus

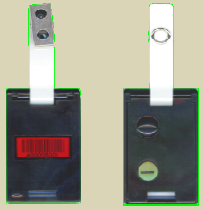

Fig 3: Holders and cards

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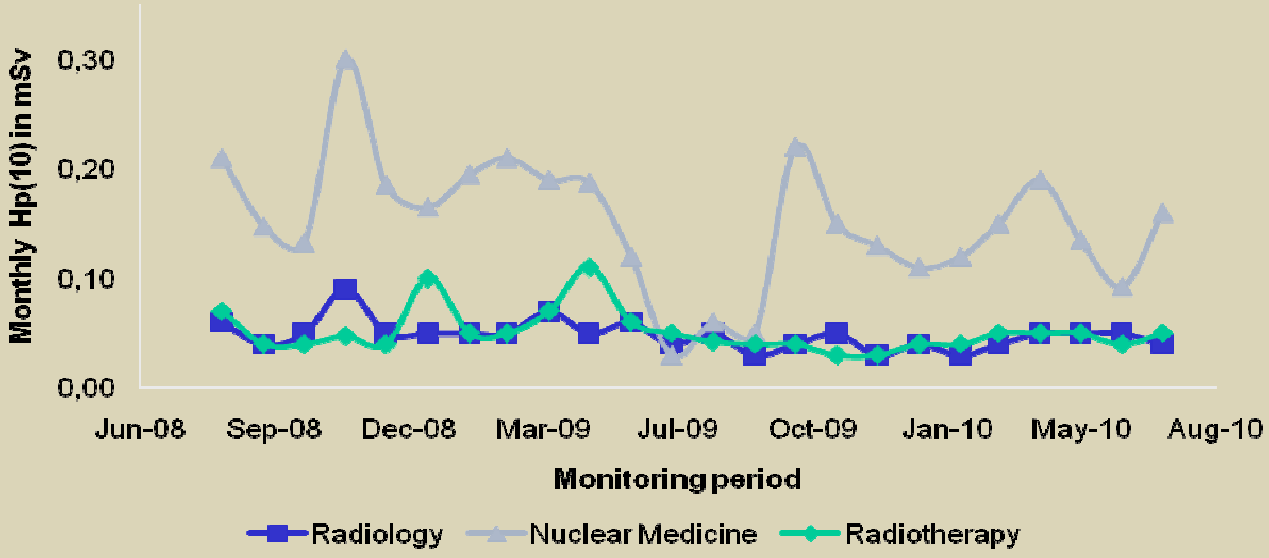
Materials and Methods: TLD Laboratory at UCR

- National cooperation technical projects with the IAEA started the implementation of a TLD Laboratory at the UCR back in the year 1994.
- In 1999, the National Authority granted the licensee to do personal monitoring.
- The UCR, in order to proof technical competence of the test started to seek the ISO/IEC 17025:2005 accreditation.
- The TLD laboratory has a Quality Management in place.
- All calibrations of the system are made using IAEA network of SSDL in Latin America.
- The laboratory has participated in a NVLAP exercise passing the ANSI standard :
  - ✓HPS N13.11-2001 Personnel Dosimetry Performance Criteria for Testing.
- Costa Rican National Accreditation Body evaluated the lab on August-2010.

Final accreditation certificate is pending.

Results: main 3 practices

Graph 1 presents the monthly 75 percentile for Hp(10) for the main 3 areas: radiology, nuclear medicine and radiotherapy. As seen, nuclear medicine has higher staff doses as expected, no significant different is appreciated between radiology and radiotherapy staff. The decrease for the period July-August 2009 in nuclear medicine correspond to shortage of Tc^{99} supplies in the country.



Results: main 3 practices

- *Table 1* presents the 75 percentile for Hp(10) based on all monthly values for all workers in each area (radiology, nuclear medicine and radiotherapy).
- *Table 2* presents the annual Hp(10) for the main 3 areas radiology, nuclear medicine and radiotherapy.

	TABLE 1: Monthy Hp(10) in mSv		
Year	Radiology	Nuclear Medicine	Radiotherapy
2008	0,06	0,18	0,04
2009	0,05	0,13	0,05
2010	0,04	0,13	0,05

	TABLE 2: Annual Hp(10) in mSv		
Year*	Radiology	Nuclear Medicine	Radiotherapy
2008	0,14	0,82	0,11
2009	0,39	1,52	0,53
2010	0,23	0,82	0,33

*Years: 2008 and 2010 based on 5 and 6 months respectively.

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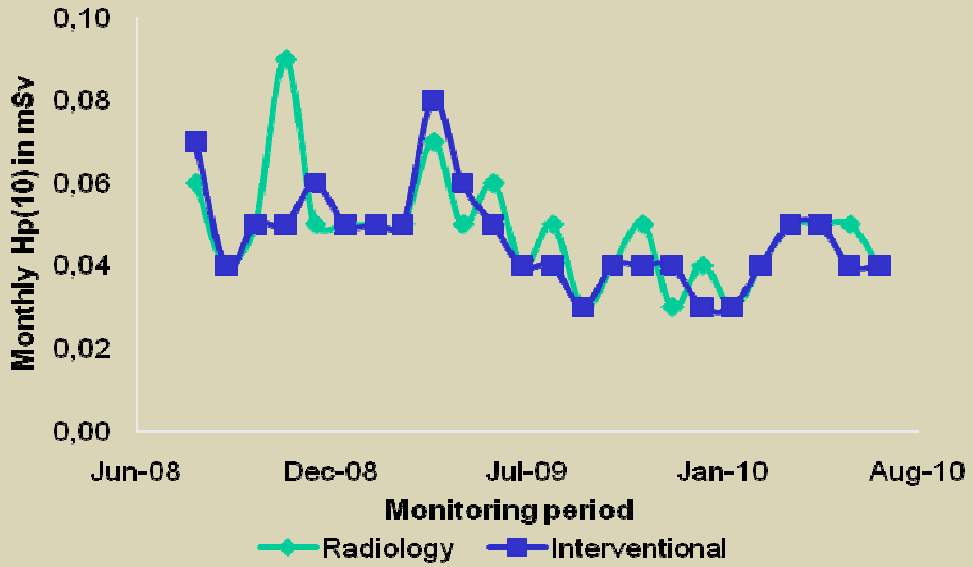
Results: interventional practices

- *Graph 2* presents the monthly 75 percentile for Hp(10) for radiology departments differentiated from interventional (ej. gastroenterology, cardiology, neurosurgery, orthopedics, etc).

- Regarding the annual 75 percentile for Hp(10) in 2009, radiology departments have 0,39 mSv and interventional departments have 0,43 mSv. Both personnel receive radiation protection courses every 2 years.



Conclusions

Assuming our reported Hp(10) doses as an adequate surrogate for effective dose for Costa Rican medical staff:

- **From *Table 2*, results on annual effective doses for radiology (0,39 mSv), nuclear medicine (1,52 mSv) and radiotherapy (0,53 mSv) compare to UNSCEAR 2008 reported world values 0,5 mSv; 0,7 mSv and 0,5 mSv respectively indicates good agreement on radiology and radiotherapy but a much higher value for nuclear medicine.**
- **No significance difference is seen so far between radiology and interventional radiology staff. (Further analysis on different sub-categories would be investigated since cardiologist usually received higher doses).**
- **Results from individual monitoring programs, such as the one held by the UCR, allows national authorities to optimize radiation protection practices (for example a further analysis should be perform on nuclear medicine staff doses).**
- **There is now a centralized dose record keeping for medical staff. UCR also has industrial and research workers.**

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