

▶ Dose Optimisation for Diagnostic Procedures – The SNMMI Point of View

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Nuclear medicine imaging has been shown to be of substantial benefit to the patient by providing the clinician with images of physiology and function. However, the use of radiopharmaceuticals also exposes the patient to ionizing radiation that may lead to subsequent adverse health effects. Based on models provide by the BEIR VII Phase 2 report, receiving an effective dose of 10 mSv may lead to a risk of 1 in a 2000 of dying of cancer¹. This estimate is based on the linear no threshold (LNT) model which basically assumes that the risk per unit dose is the same irrespective of the dose level and that the risk from each radiation exposure is independent of all other exposures. The use of LNT for radiation risk is controversial as some feel that it is much too conservative and perhaps the real risk is perhaps is negligible while others feel it may be prudent to utilize such a conservative estimate particularly for sensitive populations such as children. In 2012, the SNMMI issued a dose optimization statement that basically said that if the right test with the right dose should be given to the right patient at the right time. When nuclear medicine and molecular imaging procedures are performed correctly on appropriate patients, the benefits far outweigh the potential risks². This presentation will briefly review the scientific basis regarding the carcinogenic risk associated with radiation and the fundamentals of radiation dosimetry. Estimates will be presented on the radiation dose received following the typical administration of a number of radiopharmaceuticals. The SNMMI working with its RADAR task Force has provided an online calculator that can estimate the effective and critical organ dose for a number of radiopharmaceuticals and various size patients³. The calculator also provides embryo and fetal dose estimates for women at different stages of their pregnancy. Factors that can affect the amount of administered activity will be discussed. Cardiovascular and pediatric nuclear medicine will be emphasized during this presentation. Cardiovascular nuclear medicine including myocardial perfusion imaging continues to be one of the most prevalent nuclear medicine procedures performed and thereby is a substantial fraction of the committed dose to the population. Children are thought to be more radiosensitive than adults and thus particular attention to dose optimization should be spent in this population⁵. Other efforts on the part of the SNMMI through the Dose Optimization Task Force, the RADAR task Force and the MIRDC Committee will also be discussed.

References:

- 1 Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation NRC. Health risks from exposure to low levels of ionizing radiation. BEIR VII. 2006;Phase 2.
- 2 SNMMI Position Statement on Dose Optimization for Nuclear Medicine and Molecular Imaging Procedures. SNMMI. Reston, VA. http://interactive.snm.org/docs/SNM_Position_Statement_on_Dose_Optimization_FINAL_June_2012.pdf
- 3 SNMMI Dose Tool. SNMMI website. <http://www.snm.org/dosetool>. Updated April 16, 2014. Accessed on February 22, 2016.
- 4 Cardiovascular Council Board of Directors. Cardiovascular nuclear imaging: balancing proven clinical value and potential radiation risk. J Nucl Med. 2011;52:1162-1165.
- 5 Gelfand MJ, Parisi MT, Treves ST, Pediatric Nuclear Medicine Dose Reduction W. Pediatric radiopharmaceutical administered doses: 2010 North American consensus guidelines. J Nucl Med. 2011;52:318-322.