

Preface

Medical radiation workers make up a large group of individuals occupationally exposed to low doses of radiation. These workers have been monitored with personal dosimeters when exposed to ionizing radiation, and the records of measurements have generally been maintained. As a subcohort of the “One Million Person Study of Radiation Workers and Veterans (MPS),” being coordinated by the National Council on Radiation Protection and Measurements (NCRP), approximately 100,000 medical radiation workers (with both female and male subjects) have been identified as subjects for dose reconstruction. Dosimetry and mortality data are currently being compiled with results of the epidemiological analyses to be presented in other publications and reports. The approach to the complex dosimetry issues for medical radiation workers over three to four decades of occupational exposure are generally described in NCRP Report No. 178, *Deriving Organ Doses and Their Uncertainty for Epidemiologic Studies (with a Focus on the One Million U.S. Workers and Veterans Study of Low-Dose Radiation Health Effects)* (2018), which presents an 11-step process to guide the radiation dose reconstruction process. For the MPS epidemiologic analysis, it is often assumed that the average dose over the entire organ or tissue (organ dose) is the quantity of interest. However, the derivation of organ doses for the medical radiation worker cohort members from monitoring data poses difficult problems because of:

- extreme inhomogeneity of exposure over the body occurs when medical personnel wear protective aprons;
- medical facilities implement differing degrees and methods of radiation protection;
- medical radiation workers may wear dosimeters inconsistently (*i.e.*, at times choosing not to wear dosimeters in order to avoid investigations);
- incomplete information about the workloads of physicians and technologists (*i.e.*, the number of procedures of a given type conducted monthly or annually); and
- changing technology and medical procedure protocols.

The purpose of this Commentary is to describe an optimum approach for using personal monitoring data to estimate lung and other organ doses. The Commentary highlights specific precautions applicable to epidemiologic study of medical radiation workers. Such guidance is important as organ doses, along with associated epidemiologic analyses for both female and male populations, are necessary to assist the National Aeronautics and Space Administration’s (NASA) need to assess sex-specific lung cancer risks and radiation limits currently in place for female astronauts noting differences between the medical and space radiation environments.

The intended audiences for this Commentary are health physicists with radiation safety responsibilities in medical and other establishments and epidemiologists planning to use or review the mechanisms by which dosimetry data were derived. The Commentary presents some basic historical aspects of radiation monitoring and measurement quantities to provide a foundation for epidemiologists not familiar with radiation dosimetry and the role of personal monitoring within the regulatory framework of radiation protection.

This Commentary was prepared by Scientific Committee 6-11 on Deriving Organ Doses for Medical Radiation Workers Using Personal Monitoring Data with a Focus on Lung. Serving on Scientific Committee 6-11 were:

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The Council wishes to express its appreciation to the Committee members for the time and effort devoted to the preparation of this Commentary. NCRP could not continue to address the radiation protection needs of the nation without the willingness of Council members and others to serve, review and advise and without the partnership of agencies to work together for the good of the people and the well-being of the nation. Much of the data used to reconstruct doses for the medical radiation worker cohort arises from measurements made by Landauer, Inc. and its predecessors over a period in excess of 50 y. To assure historical accuracy of both technical and administrative data, much of which is unpublished, two members of the Committee, R. Craig Yoder and Christopher N. Passmore, were asked to serve by NCRP. Their participation does not reflect any endorsement of the commercial offerings of Landauer by NCRP.

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