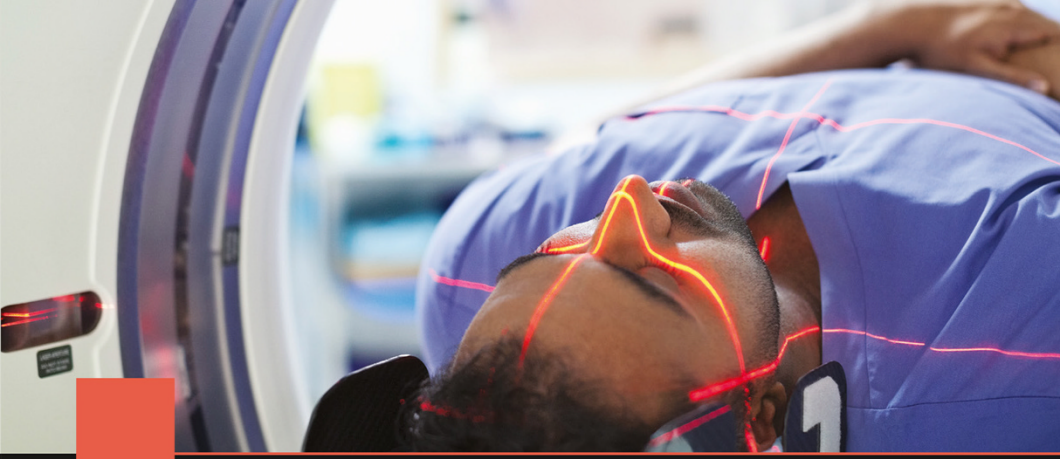

Rad Tech's Guide to

RADIATION PROTECTION

Second Edition

Euclid Seeram
SERIES EDITOR

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Rad Tech's Guide to Radiation Protection

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Euclid Seeram, PhD, FCAMRT
Full Member – Health Physics Society

Academic Appointments
Honorary Senior Lecturer; Medical Radiation Sciences; Faculty of Health Sciences; University of Sydney, Australia | Adjunct Associate Professor; Medical Imaging and Radiation Sciences; Monash University, Australia | Adjunct Professor; Faculty of Science; Charles Sturt University, Australia | Adjunct Professor; Medical Radiation Sciences; Faculty of Health; University of Canberra, Australia

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This book is dedicated with love and affection to my lovely and charming wife Trish, a brilliant, hard-working, caring, and loving individual, who taught me the very essence of life.

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Preface to the Second Edition

Radiation protection in medicine has experience an evolution through the years and has focused mainly on developing new procedures for optimizing the dose to the patient, based on objective evidence and knowledge of the biological effects of radiation exposure to not only humans but animals as well. These data have suggested that the doses from medical radiation are high and that every effort must be made to manage the dose to both patients and personnel. Another concept developed from these data is that of a dose-risk model or simply a dose-response relationship. Several models have been proposed but the one that has been supported for use in medical radiation exposure to patients is the Linear No Threshold (LNT) model. Experts Hendee and O'Connor (2012) provide a guiding argument for the use of the LNT model in diagnostic radiology as follows:

> *This model is not chosen because there is solid biologic or epidemiologic data supporting its use. Rather, it is used because of its simplicity and because it is a conservative approach ... For the purpose of establishing radiation protection standards for occupationally exposed individuals and members of the public, a conservative model that overestimates the risk is preferred over a model that underestimates risk*

Radiation protection is an essential core subject of radiologic technology programs. To meet the needs of these programs, a handful of books on radiation protection is currently available to enable students and technologists alike to acquire the skills required to protect patients, personnel, and members of

the public in the radiology department. This book, *Rad Tech's Guide to Radiation Protection*, provides a comprehensive practical guide for technologists and students engaged in the art and science of radiation protection. It main goal is to provide a resource that is brief, clear, and a concise coverage of the subject in preparation for their professional certification examination.

Rad Tech's Guide to Radiation Protection is not a textbook and it is not intended to replace the vast resources on radiation protection. Rather, it provides a précis of the extensive coverage of radiation protection topics for technologists.

Rad Tech's Guide to Radiation Protection contains 10 short chapters that cover a wide scope of topics on radiation protection. For this second edition, a new chapter on Dose Factors in Computed Tomography has been added, and a few new concepts have been introduced into the appropriate chapters. For example, the debate concerning the use of the LNT model has been included in Chapter 4, While Diagnostic Reference Levels (DRLs) are briefly outlined in Chapter 5, and Dose Optimization is reviewed briefly in Chapter 9.

Chapter 1 discusses the nature and scope of radiation protection and sets the framework for the remaining chapters. While Chapter 2 presents a description of the essential physics for radiation protection, Chapter 3 describes radiation quantities and their units. Chapter 4 outlines the basic concepts of radiobiology and Chapter 5 provides a rationale for radiation protection. Chapters 6 and 7 address the factors that affect dose levels in digital radiography and fluoroscopy, respectively. Additionally, Chapter 8 is a new Chapter on Factors Affecting the Dose in Computed Tomography. Chapter 9 provides a discussion of Dose Management Regulations and Optimization. Finally, Chapter 10 reviews radiation protection considerations in pregnancy.

Enjoy the pages that follow and remember – your patients will benefit from your wisdom.

Euclid Seeram, PhD, FCAMRT
British Columbia, Canada

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It is a pleasure to acknowledge the contributions of experts in the fields of radiobiology and radiation protection, from whom I have learned a great deal that allows me to write this book.

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Second, I am indeed grateful to all those who have dedicated their energies in providing several comprehensive volumes on medical radiation protection for the radiologic community. I would like to acknowledge the notable medical physicist, Dr. Stewart Bushong, ScD, FAAPM, FACR, and experimental radiobiologist, Dr. Elizabeth Travis, PhD. I have learned a great deal on radiologic science from the works of Dr. Bushong, a professor of radiologic science in the Department of Radiology, Baylor College of Medicine, Houston, Texas. In addition, I have gained further insight into the nature, scope, and depth of radiobiology, and particularly its significance in radiology, from Dr. Travis, a researcher in the Department of Experimental Radiotherapy, University of Texas, MD, Anderson Cancer Center, Houston, Texas. Furthermore, I would like to thank Dr. Hans Swan, PhD, and Dr. Rob Davidson, PhD, who served as my primary supervisors for my PhD dissertation entitled *Optimization of the Exposure Indicator of a Computed Radiography Imaging System as a Radiation Dose Management Strategy.*

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Distinguished Emeritus Professor, Emory University, Director, Sprawls Educational Foundation, http://www.sprawls.org, Co-Director, College on Medical Physics, ICTP, Trieste, Italy, and Co-Editor, *Medical Physics International*, http://www.mpijournal.org. Dr. Sprawls has always supported my writing and I appreciate his gracious permission to use his materials (illustrations in particular) in my textbooks on radiation protection. Thank you, Perry.

Finally, I must acknowledge the warm and wonderful support of my family; my lovely wife, Trish, a very wise and caring person, and my very smart son, David, a very special young man, and the best Dad in the universe. Thank you both for your unending love, support, and encouragement.

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