



Rad Tech's Guide to

# RADIATION PROTECTION

Second Edition

**Euclid Seeram**

SERIES EDITOR

**WILEY** Blackwell



# **Rad Tech's Guide to Radiation Protection**



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Second Edition

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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.*





# Contents

Preface to the Second Edition. . . . .	xi
Acknowledgments . . . . .	xiii
<b>1 Nature and Scope of Radiation Protection. . . . .</b>	<b>1</b>
What is Radiation Protection? . . . . .	2
Scope of Radiation Protection . . . . .	2
Diagnostic Radiology Modalities . . . . .	3
Why Protect Patients and Personnel in Diagnostic Radiology? . . . . .	3
Framework for Radiation Protection. . . . .	4
Basic Schemes for Patient Exposure in Digital Radiography, Fluoroscopy, and Computed Tomography. . . . .	6
Factors Affecting Dose in Diagnostic Radiology . . . . .	8
Dose Management Techniques . . . . .	10
Pregnancy: Radiation Protection Considerations . . . . .	11
<b>2 Diagnostic X-Rays: Essential Physical Factors . . . . .</b>	<b>13</b>
X-Ray Production. . . . .	14
Mechanisms for Creating X-Rays . . . . .	14
X-Ray Spectrum. . . . .	16
X-Ray Attenuation. . . . .	20
X-Ray Interactions. . . . .	23
Increasing kV and Scatter Production. . . . .	26
<b>3 Radiation Quantities and Units . . . . .</b>	<b>27</b>
Sources of Radiation Exposure. . . . .	29
Types of Exposure. . . . .	30

Quantities and Units for Quantifying Ionizing Radiation . . . . .	31
Quantities and Units for Quantifying Biologic Risks . . . . .	33
Radiation Measurement . . . . .	36
Wearing a Personnel Dosimeter . . . . .	38
<b>4 Basic Radiobiology . . . . .</b>	<b>39</b>
What Is Radiobiology? . . . . .	41
Essential Physics and Chemistry . . . . .	41
Fundamental Concepts of Radiobiology . . . . .	44
Deterministic Effects (Early Effects of Radiation) . . . . .	49
Stochastic Effects (Late Effects of Radiation) . . . . .	51
Radiation Exposure During Pregnancy . . . . .	54
<b>5 Current Standards for Radiation Protection . . . . .</b>	<b>55</b>
Radiation Protection Organizations . . . . .	56
Objectives of Radiation Protection . . . . .	57
Radiation Protection Criteria and Standards . . . . .	58
Recommended Dose Limits . . . . .	60
Diagnostic Reference Levels: A Useful Tool for Optimization of Protection . . . . .	62
<b>6 Dose Factors in Digital Radiography . . . . .</b>	<b>65</b>
Digital Radiography: Essential Considerations . . . . .	66
The Standardized Exposure Indicator: Basics . . . . .	68
Factors Affecting Dose in Digital Radiography . . . . .	70
<b>7 Dose Factors in Fluoroscopy . . . . .</b>	<b>77</b>
Major Components of Fluoroscopic Imaging Systems . . . . .	78
Factors Affecting Dose in Fluoroscopy . . . . .	82
Scattered Radiation in Fluoroscopy . . . . .	87

<b>8</b>	<b>Factors Affecting Dose in Computed Tomography</b>	<b>89</b>
	Computed Tomography: A Definition	90
	Nobel Prize for CT Pioneers	91
	CT Principles: the Basics	91
	Multislice CT Technology: The Pitch	93
	Dose Distribution in CT	93
	CT Dose Metrics	94
	Factors Affecting the Dose in CT	96
	Dose Optimization in CT	99
<b>9</b>	<b>Dose Management Regulations and Optimization</b>	<b>101</b>
	Federal Regulations for Dose Management	103
	Equipment Specifications for Radiography	104
	Equipment Specifications for Fluoroscopy	106
	Procedures for Minimizing Dose to Patients and Personnel	109
	Shielding: Design of Protective Barriers	112
	Quality Assurance: Dose Management and Optimization	114
<b>10</b>	<b>Pregnancy: Essential Radiation Protection Considerations</b>	<b>117</b>
	Rationale for Radiation Protection in Pregnancy	118
	Factors Affecting Dose to the Conceptus	119
	Estimating the Dose to the Conceptus	120
	Continuing/Terminating a Pregnancy After Exposure	120

## **x** Contents

Dose Reduction Techniques for Pregnant Patients.....	121
The Pregnant Worker.....	121
References.....	125
Index.....	129

# Preface to the Second Edition

**R**adiation protection in medicine has experienced 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. Its 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.

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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.

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