

# Contents

<b>1</b>	<b>Introduction . . . . .</b>	<b>1</b>
	Introduction . . . . .	1
	Digital Imaging Systems in Modern Healthcare . . . . .	2
	Impact of Digital Technologies in Diagnostic	
	Quality and Safety . . . . .	3
	Chapter Outline . . . . .	5
	Chapter 2: Digital Radiography Detectors:	
	A Technical Overview . . . . .	5
	Chapter 3: Digital Radiography Detector Performance . . . . .	6
	Chapter 4: Technical Considerations Concerning	
	Digital Technologies . . . . .	6
	Chapter 5: Assessment of Patient Dose in Digital Systems . . . . .	6
	Chapter 6: Image Quality in Diagnostic Radiology . . . . .	6
	Chapter 7: Practical Insights into Digital Radiology . . . . .	6
	Chapter 8: Image Enhancement for Digital Radiography . . . . .	6
	Chapter 9: Digital Radiology and Picture Archiving	
	and Communication System . . . . .	7
	References . . . . .	7
<b>2</b>	<b>Digital Radiography Detectors: A Technical Overview . . . . .</b>	<b>9</b>
	Introduction . . . . .	9
	Overview of Computed Radiography and Digital	
	Radiography Detectors . . . . .	10
	Computed Radiography . . . . .	12
	Digital Radiography . . . . .	14
	Large-Area Direct-Conversion Systems . . . . .	15
	Large-Area Indirect-Conversion Systems . . . . .	17
	Summary . . . . .	17
	References . . . . .	18

<b>3</b>	<b>Digital Radiography Detector Performance . . . . .</b>	<b>21</b>
	Introduction . . . . .	21
	Image Acquisition . . . . .	22
	Quantitative Measure Determination Methods . . . . .	23
	Modulation Transfer Function Determination . . . . .	25
	Noise Power Spectra Determination . . . . .	30
	Detective Quantum Efficiency Determination . . . . .	31
	Summary . . . . .	35
	References . . . . .	35
<b>4</b>	<b>Technical Considerations Concerning Digital Technologies . . . . .</b>	<b>37</b>
	Introduction . . . . .	37
	Digital Technologies in Practice . . . . .	38
	Equipment and Technique . . . . .	38
	X-Ray Tube and X-Ray Production . . . . .	39
	Exposure Parameters . . . . .	40
	Collimation and Field Size . . . . .	41
	Source to Image–Detector Distance . . . . .	41
	Anti-scatter Grid . . . . .	42
	Beam Filtration . . . . .	42
	Requirements and Advantages of Digital Technologies . . . . .	43
	Summary . . . . .	46
	References . . . . .	47
<b>5</b>	<b>Assessment of Patient Dose in Digital Systems . . . . .</b>	<b>49</b>
	Introduction . . . . .	49
	Effects of Radiation Exposure . . . . .	50
	Patient Dose Concepts . . . . .	51
	Absorbed Dose . . . . .	52
	Equivalent Dose . . . . .	52
	Effective Dose . . . . .	52
	Dose Area Product . . . . .	54
	Entrance Skin Dose . . . . .	55
	Exposure Index and Detector Exposure . . . . .	55
	Diagnostic Reference Levels . . . . .	57
	Exposure Influence in Dose and Image Representation . . . . .	59
	Summary . . . . .	60
	References . . . . .	61
<b>6</b>	<b>Image Quality in Diagnostic Radiology . . . . .</b>	<b>63</b>
	Introduction . . . . .	63
	Digital Image Representation . . . . .	63

Spatial Domain Representation . . . . .	64
Frequency Domain Representation . . . . .	66
Grey Level Representation . . . . .	67
Image Quality Evaluation . . . . .	70
Primary Physical Image Quality Parameters . . . . .	71
Objective Image Quality Measurements . . . . .	72
Observer Performance Methods . . . . .	73
Summary . . . . .	75
References . . . . .	76
<b>7 Practical Insights into Digital Radiology . . . . .</b>	<b>79</b>
Introduction . . . . .	79
Digital Radiology Systems Performance . . . . .	80
Digital Image and Exposure Parameters . . . . .	81
Cross-Sectional Survey . . . . .	81
DICOM Log File . . . . .	84
Dose Optimization and Patient Protection . . . . .	86
A Phantom Study . . . . .	86
Exposure Index Evaluation in Clinical Practice . . . . .	91
Diagnostic Image Quality in Digital Radiology . . . . .	95
Observer's Performance in an ROC Analysis	
Using a Chest Phantom . . . . .	96
Observer's Performance in a VGAS	
Using Images from Patients . . . . .	99
Optimization Framework in Digital Radiology . . . . .	105
Summary . . . . .	106
References . . . . .	107
<b>8 Image Enhancement for Digital Radiography . . . . .</b>	<b>109</b>
Introduction . . . . .	109
Global Spatially Independent Methods . . . . .	111
Characteristic Curve Modification . . . . .	111
The Histogram . . . . .	115
Histogram Modification . . . . .	115
Adaptive Histogram . . . . .	117
Filtering Methods . . . . .	119
Linear Smoothing Filters . . . . .	122
Linear Sharpening Filters . . . . .	123
Composed Spatial Enhancement . . . . .	126
Morphological Contrast Enhancement . . . . .	128
Multi-Scale Processing . . . . .	130
Summary . . . . .	135
References . . . . .	136

<b>9 Digital Radiology and Picture Archiving and Communication System (PACS)</b>	137
Introduction	137
A Change of Paradigm	138
The IHE Framework	139
PACS Architectures	140
The General Concept	140
PACS Components	141
Current Architectures	143
DICOM in a Glance	145
An Object-Oriented Standard	145
Information Objects	148
The Digital X-Ray IOD	149
Dose	153
DICOM Files	154
Searching the PACS	155
Summary	157
References	158
<b>Index</b>	159

Digital Imaging Systems for Plain Radiography

Lanca, L.; Silva, A.

2013, XIV, 161 p., Hardcover

ISBN: 978-1-4614-5066-5