## Contents

1	Before the Cardiac Catheterization Laboratory
1	Examination and Treatment Planning
	Torsten Konrad, Erhard Kaiser, and Tonja Gaibler
1.1	Patient Preparation
1.1.1	Introduction
1.1.2	Standards for the Performance of Diagnostic Coronary Angiography
	and Elective Coronary Interventions
1.1.3	Standards for the Performance of Emergency Interventions
1.1.4	Selection and Preparation of the Access Route
1.1.5	Examination Under Anticoagulation
1.1.6	Use of Checklists in the Cardiac Catheterization Laboratory
1.2	Legal Aspects of Patient Information
1.2.1	Introduction
1.2.2	Contents of the Enlightenment
1.2.3	Risk Disclosure
1.2.4	Intervention-Specific, Typical Risks
1.2.5	Risk Medication Consent
1.2.6	Treatment Alternatives
1.2.7	New Medical Territory
1.2.8	Timing of Informed Consent
1.2.9	Emergency Informed Consent
1.2.10	Formal Criteria of Informed Consent
1.2.11	Informed Consent by Telephone Permissible?
1.2.12	Safeguarding Information or Therapeutic Information
	and Economic Information
1.3	Conclusion
	References
H	In the Cardiac Catheterization Laboratory
2	Procedural Complications
	Erhard Kaiser, Michael Markant, Ralf Birkemeyer, and Thomas
	Twisselmann
2.1	Puncture Site Related Complications
2.1.1	Femoral Access Route
2.1.2	Radial Access
2.2	Aortic Complications
2.2.1	Epidemiology
2.2.2	Complications in the Area of the Infrarenal Aorta
2.2.3	Complications in the Area of the Landing Zone/Ascending Aorta
2.2.4	Kinking of the Aorta
2.2.5	Aortic Aneurysms



2.3	Complications During Catheter Placement	43
2.3.1	History of Medicine	43
2.3.2	Dissections	45
2.3.3	Arrhythmias and Hypotension	48
2.3.4	Perforations and Tamponade	48
2.3.5	Selection of the Guide Catheter	50
2.4	Complications of Coronary Wire Placement	53
2.4.1	Properties of Coronary Wires	53
2.4.2	Coronary Perforation by the Coronary Wire	54
2.4.3	Coronary Dissection by the Coronary Wire	54
2.4.4	Wire Rupture in the Coronary Vessel	55
2.5	Complications of Balloon Dilatation	55
2.5.1	Introduction	55
2.5.2	Balloon Angioplasty Alone, POBA	56
2.5.3	Success Rate of Balloon Angioplasty	56
2.5.4	Dissections After Balloon Angioplasty	58
2.5.5	Restenosis After Balloon Angioplasty	60
2.5.6	Vascular Occlusions After Balloon Angioplasty	60
2.5.7	Coronary Perforation After Balloon Angioplasty	61
2.5.8	Need for Bypass Surgery After Balloon Angioplasty	62
2.5.9	Dilatation of Ostial Stenoses and Bifurcation Stenoses	62
2.5.10	Dilatation of Long Stenoses	63
2.5.11	Dilatation of Bypass Stenoses	63
2.6	Complications of Stent Implantation	64
2.6.1	Stent Loss	64
2.6.2	The Non-dilatable Stent	67
2.6.3	Vessel Rupture During Stent Implantation	69
2.6.4	Edge Dissection	73
2.6.5	Closure of Side Branches	73
2.6.6	Distal Embolization and No Reflow	74
2.6.7	Stent Thrombosis	75
2.7	Thromboembolic Complications and Thrombus Management	76
2.7.1	Pathophysiology	76
2.7.2	Prognosis	77
2.7.2	Pharmacological Therapy of Thromboembolic Complications	78
2.7.4	Manual Thrombus Aspiration	82
2.7. <del>5</del> 2.7.5	Mechanical Thrombus Aspiration	83
2.7.5 2.7.6	Distal Protection	84
2.7.0	References	
	nelerences	86
3	Periprocedural Complications	97
	Erhard Kaiser, Jan Pollmann, Carsten Skurk, and Martin Müller	
3.1	Contrast Media Induced Allergy	99
3.1.1	Clinical Presentation	99
3.1.2	Prophylaxis of Contrast Agent Incidents	99
3.1.3	Management of Severe Contrast Reaction	99
3.1.4	Examination in Latent and Evident Hyperthyroidism	100
3.2	Contrast-Induced Nephropathy	101
3.2.1	Definition and Incidence	101
3.2.2	Pathogenesis	103
2.2.2	Prophylavic and Thorany	100

3.3	Hemodynamic Instability and Circulatory Management	104
3.3.1	Monitoring in the Cardiac Catheterization Laboratory	104
3.3.2	Bradycardic Arrhythmias	104
3.3.3	Tachycardic Arrhythmias	104
3.3.4	Cardiogenic Shock: Causes, Diagnosis and Therapy	105
3.4	Airway Management in the Cardiac Catheterization Laboratory	113
3.4.1	Introduction	113
3.4.2	Endotracheal Intubation	113
3.4.3	Supraglottic Airway Support, Laryngeal Tube	117
3.4.4	Video Laryngoscopy	118
3.4.5	Sedation in the Cardiac Catheterization Laboratory	118
3.5	Cardiopulmonary Resuscitation in the Cardiac	
	Catheterization Laboratory	120
3.5.1	General Remarks and Strategy of CPR in the Cardiac	
	Catheterization Laboratory	120
3.5.2	Defibrillation Strategy in the Cardiac Catheterization Laboratory	121
3.5.3	Technical Equipment	121
3.5.4	Staffing	122
3.5.5	Typical Triggers of Resuscitation Situations in the Cardiac	1 4-4-
0.0.0	Catheterisation Laboratory	122
	References	123
	THE CONCESSION OF THE CONCESSI	123
4	Error Management	127
	Kai-Uwe R. Strelow and Erhard Kaiser	
4.1	What Can We Learn from Aviation?	128
4.1.1	Introduction	128
4.1.2	History of the Development of Human Factors Training	129
4.1.3	The Five Evolutionary Stages of Crew Resource Management	130
4.1.4	Legal Basis and Guidelines for CRM Training	131
4.1.5	Scope and Content of Human Factors Training Courses	131
4.1.6	The Assessment of Behavioural Performance in Aviation	133
4.2	Transferability of Human Factors Concepts from Aviation	
	to Medicine	134
4.2.1	Crisis Resource Management (CRM) Seminars	135
4.2.2	CRM in Medical Education and Training	135
4.2.3	The Importance of Simulation for CRM in Medicine	136
4.2.4	The Evaluation of Behavioural Performance in the Context	750
1.2.1	of Crisis Resource Management	136
4.2.5	Error Culture Versus Blaiming Culture	139
4.2.6	Influences on the Implementation of CRM from the Aviation	139
7.2.0	Perspective	139
4.2.7	Routine Situation Versus Incident	141
4.2.7	NOUTH SITUATION VEISUS INCIDENT	141
7.4.0	Team and Interfaces	1.41
420	Team and Interfaces	141
4.2.9	Team and Interfaces	141 142 142

5	Error Management in Interventional Cardiology	145
	Erhard Kaiser	
5.1	Education and Training Situation in Interventional Cardiology	146
5.2	Optimization of Procedural and Periprocedural Complication	
	Management in the Cardiac Catheterization Laboratory	148
5.2.1	Technical Skills Training	148
5.2.2	Non-technical Skills Training, Emergency Management	148
5.3	Outlook	153
	References	154
Ш	After the Cardiac Catheterization Laboratory	
Ш	After the Cardiac Catheterization Laboratory	
<b>III</b> 6	After the Cardiac Catheterization Laboratory  Patient Follow-Up	159
	·	159
	Patient Follow-Up	159
6	Patient Follow-Up  Torsten Konrad and Erhard Kaiser	159 160
6	Patient Follow-Up  Torsten Konrad and Erhard Kaiser  Removing the Intra-arterial Sheath and Closing/Pressing	
6	Patient Follow-Up  Torsten Konrad and Erhard Kaiser  Removing the Intra-arterial Sheath and Closing/Pressing the Puncture Site	160
6 6.1 6.1.1	Patient Follow-Up  Torsten Konrad and Erhard Kaiser  Removing the Intra-arterial Sheath and Closing/Pressing the Puncture Site  Access via the Groin, Puncture of the Common Femoral Artery	160 160
6 6.1 6.1.1 6.1.2	Patient Follow-Up  Torsten Konrad and Erhard Kaiser  Removing the Intra-arterial Sheath and Closing/Pressing the Puncture Site  Access via the Groin, Puncture of the Common Femoral Artery  Access via the Arm, Puncture of the Radial Artery	160 160
6 6.1 6.1.1 6.1.2	Patient Follow-Up  Torsten Konrad and Erhard Kaiser  Removing the Intra-arterial Sheath and Closing/Pressing the Puncture Site  Access via the Groin, Puncture of the Common Femoral Artery  Access via the Arm, Puncture of the Radial Artery  Monitoring After Coronary Angiography and Coronary	160 160 163
6 6.1 6.1.1 6.1.2 <b>6.2</b>	Patient Follow-Up  Torsten Konrad and Erhard Kaiser  Removing the Intra-arterial Sheath and Closing/Pressing the Puncture Site  Access via the Groin, Puncture of the Common Femoral Artery  Access via the Arm, Puncture of the Radial Artery  Monitoring After Coronary Angiography and Coronary Intervention	160 160 163