

Mc
Graw
Hill
Education

AMERICAN
ASSOCIATION
of CRITICAL-CARE
NURSES

AACN

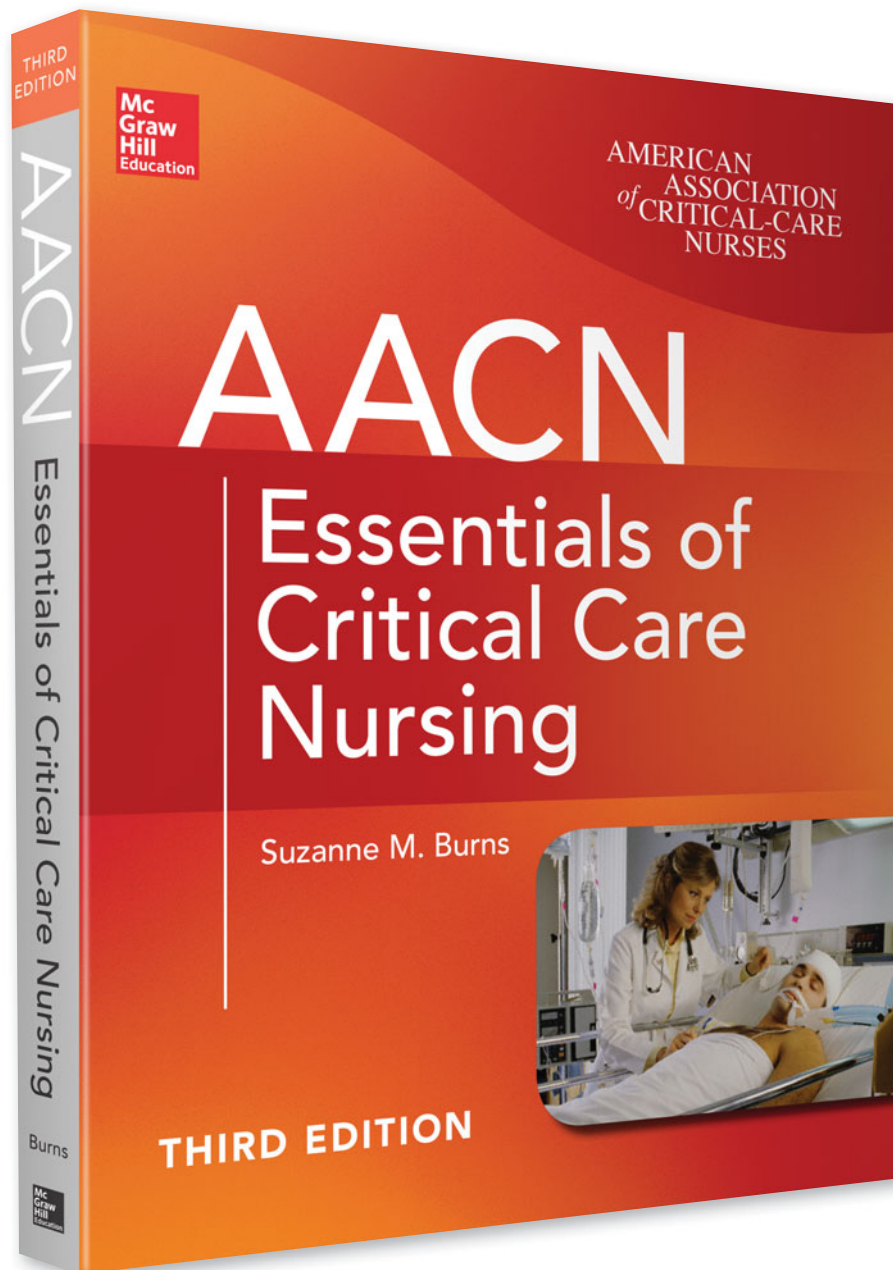
Essentials of Critical Care Nursing

Suzanne M. Burns



THIRD EDITION

Also from McGraw-Hill Medical:



978-0-07-182279-4

**Available everywhere
medical books are sold**



Medical

mcgrawhillmedical.com

AACN Essentials of Critical Care Nursing

Third Edition

Suzanne M. Burns, MSN, RRT, ACNP, CCRN, FAAN, FCCM, FAANP

Professor Emeritus, School of Nursing

University of Virginia

Consultant, Critical and Progressive Care and Clinical Nursing Research

Charlottesville, Virginia



Medical

New York Chicago San Francisco Athens London Madrid Mexico City
Milan New Delhi Singapore Sydney Toronto

Copyright © 2014, 2010, 2006 by McGraw-Hill Education. All rights reserved. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

ISBN: 978-0-07-182553-5

MHID: 0-07-182553-3

The material in this eBook also appears in the print version of this title: ISBN: 978-0-07-182279-4,
MHID: 0-07-182279-8.

eBook conversion by codeMantra
Version 2.0

All trademarks are trademarks of their respective owners. Rather than put a trademark symbol after every occurrence of a trademarked name, we use names in an editorial fashion only, and to the benefit of the trademark owner, with no intention of infringement of the trademark. Where such designations appear in this book, they have been printed with initial caps.

McGraw-Hill Education eBooks are available at special quantity discounts to use as premiums and sales promotions or for use in corporate training programs. To contact a representative, please visit the Contact Us page at www.mhprofessional.com.

NOTICE

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required. The authors and the publisher of this work have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication. However, in view of the possibility of human error or changes in medical sciences, neither the authors nor the publisher nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they disclaim all responsibility for any errors or omissions or for the results obtained from use of the information contained in this work. Readers are encouraged to confirm the information contained herein with other sources. For example and in particular, readers are advised to check the product information sheet included in the package of each drug they plan to administer to be certain that the information contained in this work is accurate and that changes have not been made in the recommended dose or in the contraindications for administration. This recommendation is of particular importance in connection with new or infrequently used drugs.

TERMS OF USE

This is a copyrighted work and McGraw-Hill Education and its licensors reserve all rights in and to the work. Use of this work is subject to these terms. Except as permitted under the Copyright Act of 1976 and the right to store and retrieve one copy of the work, you may not decompile, disassemble, reverse engineer, reproduce, modify, create derivative works based upon, transmit, distribute, disseminate, sell, publish or sublicense the work or any part of it without McGraw-Hill Education's prior consent. You may use the work for your own noncommercial and personal use; any other use of the work is strictly prohibited. Your right to use the work may be terminated if you fail to comply with these terms.

THE WORK IS PROVIDED "AS IS." MCGRAW-HILL EDUCATION AND ITS LICENSORS MAKE NO GUARANTEES OR WARRANTIES AS TO THE ACCURACY, ADEQUACY OR COMPLETENESS OF OR RESULTS TO BE OBTAINED FROM USING THE WORK, INCLUDING ANY INFORMATION THAT CAN BE ACCESSED THROUGH THE WORK VIA HYPERLINK OR OTHERWISE, AND EXPRESSLY DISCLAIM ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. McGraw-Hill Education and its licensors do not warrant or guarantee that the functions contained in the work will meet your requirements or that its operation will be uninterrupted or error free. Neither McGraw-Hill Education nor its licensors shall be liable to you or anyone else for any inaccuracy, error or omission, regardless of cause, in the work or for any damages resulting therefrom. McGraw-Hill Education has no responsibility for the content of any information accessed through the work. Under no circumstances shall McGraw-Hill Education and/or its licensors be liable for any indirect, incidental, special, punitive, consequential or similar damages that result from the use of or inability to use the work, even if any of them has been advised of the possibility of such damages. This limitation of liability shall apply to any claim or cause whatsoever whether such claim or cause arises in contract, tort or otherwise.

To my critical care nursing colleagues around the world, whose wonderful work and efforts ensure the safe passage of patients through the critical care environment. Special thanks to Marianne Chulay RN, PhD, FAAN, my dear friend and colleague, for her many contributions and mentoring during the development of the first two editions of the Essentials of Critical Care Nursing and the Essentials of Progressive Care Nursing books. Her inspiration, drive, and thoughtful approach to the books continue to be an inspiration to me and the authors with whom she worked.

This page intentionally left blank

Contents

<i>Contributors</i>	<i>xvii</i>
<i>Reviewers</i>	<i>xix</i>
<i>Preface</i>	<i>xxi</i>
Section I. The Essentials	1
1. Assessment of Critically Ill Patients and Their Families..... <i>Mary Fran Tracy</i>	3
2. Planning Care for Critically Ill Patients and Their Families..... <i>Mary Fran Tracy</i>	19
3. Interpretation and Management of Basic Cardiac Rhythms..... <i>Carol Jacobson</i>	35
4. Hemodynamic Monitoring..... <i>Leanna R. Miller</i>	69
5. Airway and Ventilatory Management..... <i>Robert E. St. John and Maureen A. Seckel</i>	119
6. Pain, Sedation, and Neuromuscular Blockade Management..... <i>Yvonne D'Arcy and Suzanne M. Burns</i>	159
7. Pharmacology..... <i>Earnest Alexander</i>	183
8. Ethical and Legal Considerations..... <i>Sarah Delgado</i>	215
Section II. Pathologic Conditions	231
9. Cardiovascular System..... <i>Barbara Leeper</i>	233
10. Respiratory System..... <i>Maureen A. Seckel</i>	263
11. Multisystem Problems..... <i>Ruth M. Kleinpell</i>	293
12. Neurologic System..... <i>Dea Mahanes</i>	311

13. Hematologic and Immune Systems.....	337
<i>Diane K. Dressler</i>	
14. Gastrointestinal System	351
<i>Deborah A. Andris, Elizabeth Krzywda, Carol Rees Parrish, and Joe Krenitsky</i>	
15. Renal System	383
<i>Carol Hinkle</i>	
16. Endocrine System.....	399
<i>Christine Kessler</i>	
17. Trauma	415
<i>Allen C. Wolfe and Benjamin W. Hughes</i>	
Section III. Advanced Concepts in Caring for the Critically Ill Patient	431
18. Advanced ECG Concepts	433
<i>Carol Jacobson</i>	
19. Advanced Cardiovascular Concepts	475
<i>Barbara Leeper</i>	
20. Advanced Respiratory Concepts: Modes of Ventilation.....	507
<i>Suzanne M. Burns</i>	
21. Advanced Neurologic Concepts	517
<i>Dea Mahanes</i>	
Section IV. Key Reference Information	541
22. Normal Values Table	543
<i>Suzanne M. Burns</i>	
23. Pharmacology Tables	545
<i>Earnest Alexander</i>	
24. Advanced Cardiac Life Support Algorithms.....	559
<i>Suzanne M. Burns</i>	
25. Hemodynamic Troubleshooting Guide.....	563
<i>Leanna R. Miller</i>	
26. Cardiac Rhythms, ECG Characteristics, and Treatment Guide.....	571
<i>Carol Jacobson</i>	
<i>Index</i>	<i>581</i>

Contents in Detail

<i>Contributors</i>	<i>xvii</i>
<i>Reviewers</i>	<i>xix</i>
<i>Preface</i>	<i>xxi</i>
Section I. The Essentials	1
1. Assessment of Critically Ill Patients and Their Families	3
<i>Mary Fran Tracy</i>	
Assessment Framework 3	
Prerival Assessment 4 / Admission Quick Check 4 / Comprehensive Initial Assessment 4 /	
Ongoing Assessment 4 / Patient Safety Considerations in Admission Assessments 4	
Prerival Assessment: Before The Action Begins 5	
Admission Quick Check Assessment: The First Few Minutes 6	
Airway and Breathing 6 / Circulation and Cerebral Perfusion 7 / Chief Complaint 7 /	
Drugs and Diagnostic Tests 7 / Equipment 8	
Comprehensive Initial Assessment 8	
Past Medical History 9 / Social History 9 / Physical Assessment by Body System 9 /	
Psychosocial Assessment 14	
Ongoing Assessment 16	
Selected Bibliography 16	
Critical Care Assessment 16 / Evidence-Based Practice 16	
2. Planning Care for Critically Ill Patients and Their Families	19
<i>Mary Fran Tracy</i>	
Multidisciplinary Plan of Care 19	
Planning Care Through Staffing Considerations 20	
Patient Safety Considerations in Planning Care 20	
Prevention of Common Complications 21	
Physiologic Instability 21 / Deep Venous Thrombosis 22 / Hospital-Acquired Infections 22 /	
Skin Breakdown 23 / Sleep Pattern Disturbance 24 / Psychosocial Impact 24	
Patient and Family Education 26	
Assessment of Learning Readiness 26 / Strategies to Address Patient and Family Education 26 /	
Principles for Educational Outcome Monitoring 27	
Family-Focused Care 27	
Transporting The Critically Ill Patient 28	
Assessment of Risk for Complications 29 / Level of Care Required During Transport 30 /	
Preparation 30 / Transport 31 / Interfacility Transfers 32	
Transitioning to the Next Stage of Care 33	
Supporting Patients and Families During the Dying Process 33	
Selected Bibliography 33	

Patient and Family Needs 33 / Infection Control 33 / Patient and Family Education 34 /
 Psychological Problems 34 / Sleep Deprivation 34 / Transport of Critically Ill Patients 34 /
 Evidence-Based Practice 34

3. Interpretation and Management of Basic Cardiac Rhythms 35
Carol Jacobson
 Basic Electrophysiology 35
 ECG Waveforms, Complexes, and Intervals 36
 P Wave 36 / QRS Complex 37 / T Wave 37 / U Wave 37 / PR Interval 37 / ST Segment 37 / QT
 Interval 37
 Basic Electrocardiography 37
 Cardiac Monitoring 37
 Determination of the Heart Rate 40
 Determination of Cardiac Rhythm 40
 Common Arrhythmias 41
 Rhythms Originating in the Sinus Node 41
 Normal Sinus Rhythm 41 / Sinus Bradycardia 41 / Sinus Tachycardia 42 / Sinus Arrhythmia 42 /
 Sinus Arrest 42
 Arrhythmias Originating in the Atria 43
 Premature Atrial Complexes 43 / Wandering Atrial Pacemaker 44 / Atrial Tachycardia 44 / Atrial
 Flutter 45 / Atrial Fibrillation 47 / Supraventricular Tachycardia (SVT) 51
 Arrhythmias Originating in the Atrioventricular Junction 52
 Premature Junctional Complexes 52 / Junctional Rhythm, Accelerated Junctional Rhythm, and
 Junctional Tachycardia 53
 Arrhythmias Originating in the Ventricles 53
 Premature Ventricular Complexes 53 / Ventricular Rhythm and Accelerated Ventricular Rhythm 54 /
 Ventricular Tachycardia 55 / Ventricular Fibrillation 56 / Ventricular Asystole 56
 Atrioventricular Blocks 57
 First-Degree Atrioventricular Block 57 / Second-Degree Atrioventricular Block 57 / High-Grade
 Atrioventricular Block 58 / Third-Degree Atrioventricular Block (Complete Block) 59
 Temporary Pacing 60
 Indications 60 / Transvenous Pacing 61 / Epicardial Pacing 62 / Components of a Pacing System 62 /
 Basics of Pacemaker Operation 62 / Initiating Transvenous Ventricular Pacing 64 / Initiating
 Epicardial Pacing 64 / External (Transcutaneous) Pacemakers 64
 Defibrillation and Cardioversion 64
 Defibrillation 64 / Automatic External Defibrillators 65 / Cardioversion 65
 Selected Bibliography 66
 Evidence-Based Practice 67
4. Hemodynamic Monitoring 69
Leanna R. Miller
 Hemodynamic Parameters 69
 Cardiac Output 69 / Components of Cardiac Output/Cardiac Index 71 / Stroke Volume and Stroke
 Volume Index 72 / Ejection Fraction 72 / Factors Affecting Stroke Volume/Stroke Volume Index 72
 Basic Components of Hemodynamic Monitoring Systems 76
 Pulmonary Artery Catheter 76 / Arterial Catheter 77 / Pressure Tubing 77 / Pressure Transducer 78 /
 Pressure Amplifier 78 / Pressure Bag and Flush Device 78 / Alarms 78
 Obtaining Accurate Hemodynamic Values 79
 Zeroing the Transducer 79 / Leveling the Transducer to the Catheter Tip 79 / Calibration of the
 Transducer/Amplifier System 80 / Ensuring Accurate Waveform Transmission 81
 Insertion and Removal of Catheters 81
 Pulmonary Artery Catheters 81 / Arterial Catheters 85
 Obtaining and Interpreting Hemodynamic Waveforms 85
 Patient Positioning 88 / Interpretation 88 / Artifacts in Hemodynamic Waveforms: Respiratory
 Influence 95 / Cardiac Output 96
 Continuous Mixed and Central Venous Oxygen Monitoring 101
 Continuous Mixed and Central Venous Oxygen Monitoring 101 / Selected Examples of Clinical
 Applications 103

Right Ventricular Ejection Fraction Catheters	103
Monitoring Principles	103 / Troubleshooting 104
Minimally Invasive Hemodynamic Monitoring	104
Thoracic Bioimpedance	104 / Esophageal Doppler Cardiac Output 104 / Carbon Dioxide Rebreathing 105 / Gastric Tonometry 105 / Sublingual Capnometry 105 / Pulse Contour Measurement 106
Application of Hemodynamic Parameters	107
Low Cardiac Output States	107 / High Cardiac Output States 111
Selected Bibliography	114
Hemodynamic Monitoring	114 / Minimally Invasive Hemodynamic Monitoring 115 / Therapeutics 116 / Evidence-Based Practice Guidelines 118
5. Airway and Ventilatory Management.....	119
<i>Robert E. St. John and Maureen A. Seckel</i>	
Diagnostic Tests, Monitoring Systems and Respiratory Assessment Techniques	119
Arterial Blood Gas Monitoring	119 / Venous Blood Gas Monitoring 124 / Pulse Oximetry 124 / Assessing Pulmonary Function 126
Airway Management	127
Oropharyngeal Airway	127 / Nasopharyngeal Airway 128 / Artificial Airways 128 / Endotracheal Suctioning 131
Oxygen Therapy	133
Complications	133 / Oxygen Delivery 133
Basic Ventilatory Management	136
Indications	136 / General Principles 137 / Modes 140 / Complications of Mechanical Ventilation 142 / Weaning from Short-Term Mechanical Ventilation 144 / Weaning From Long-Term Mechanical Ventilation 146 / Respiratory Fatigue, Rest, and Conditioning 148 / Wean Trial Protocols 148 / Other Protocols for Use 148 / Critical Pathways 149 / Systematic Institutional Initiatives for the Management of the LTMV Patient Population 149 / Troubleshooting Ventilators 149 / Communication 150 / Principles of Management 153
Selected Bibliography	155
General Critical Care	155 / Ventilator Management 156 / Weaning From Mechanical Ventilation 156 / Communication 156 / Evidence-Based Resources 156
6. Pain, Sedation, and Neuromuscular Blockade Management	159
<i>Yvonne D'Arcy and Suzanne M. Burns</i>	
Physiologic Mechanisms of Pain	159
Peripheral Mechanisms	159 / Spinal Cord Integration 160 / Central Processing 161
Responses to Pain	161
Pain Assessment	162
A Multimodal Approach to Pain Management	162
Nonsteroidal Anti-Inflammatory Drugs	164
Side Effects	164
Opioids	164
Side Effects	164 / Intravenous Opioids 166 / Patient-Controlled Analgesia 166 / Switching From IV to Oral Opioid Analgesia 166
Epidural Analgesia	167
Epidural Opioids	167 / Epidural Local Anesthetics 169
Cutaneous Stimulation	169
Distraction	170
Imagery	171
Relaxation Techniques	171
Deep Breathing and Progressive Relaxation	171 / Presence 171
Special Considerations for Pain Management in the Elderly	171
Assessment	171 / Interventions 172
Sedation	172
Reasons for Sedation	172 / Drugs for Sedation 173 / Drugs for Delirium 174 / Goals of Sedation, Monitoring, and Management 174
Neuromuscular Blockade	175
Neuromuscular Blocking Agents	175 / Monitoring and Management 178

Selected Bibliography	179
Pain Management 179 / Sedation and Neuromuscular Blockade 180 / Evidence-Based Practice Guidelines 181	
7. Pharmacology	183
<i>Earnest Alexander</i>	
Medication Safety	183
Medication Administration Methods	184
Intravenous 184 / Intramuscular or Subcutaneous 184 / Oral 184 / Sublingual 185 / Intranasal 185 / Transdermal 185	
Central Nervous System Pharmacology	185
Sedatives 185 / Analgesics 189 / Neuromuscular Blocking Agents 190 / Anticonvulsants 192	
Cardiovascular System Pharmacology	196
Miscellaneous Agents 196 / Parenteral Vasodilators 196 / Antiarrhythmics 199 / Vasopressor Agents 201 / Inotropic Agents 202	
Antibiotic Pharmacology	202
Aminoglycosides 203 / Vancomycin 203	
Pulmonary Pharmacology	204
Theophylline 204 / Albuterol 205 / Levalbuterol 205	
Gastrointestinal Pharmacology	205
Stress Ulcer Prophylaxis 205 / Acute Peptic Ulcer Bleeding 206 / Variceal Hemorrhage 206	
Renal Pharmacology	206
Diuretics 206	
Hematologic Pharmacology	208
Anticoagulants 208 / Factor Xa Inhibitors 209 / Direct Thrombin Inhibitors 210 / Glycoprotein IIb/IIIa Inhibitor 210 / Thrombolytic Agents 210	
Immunosuppressive Agents	211
Cyclosporine 211 / Tacrolimus (FK506) 212 / Sirolimus (Rapamycin) 212	
Special Dosing Considerations	213
Continuous Renal Replacement Therapy 213 / Drug Disposition in the Elderly 213 / Therapeutic Drug Monitoring 213	
Selected Bibliography	214
General 214 / Evidence-Based Practice Guidelines 214	
8. Ethical and Legal Considerations	215
<i>Sarah Delgado</i>	
The Foundation for Ethical Decision Making	215
Professional Codes and Standards 215 / Position Statements and Guidelines 216 / Institutional Policies 217 / Legal Standards 217 / Principles of Ethics 217 / The Ethic of Care 220 / Paternalism 220 / Patient Advocacy 221	
The Process of Ethical Analysis	222
Assessment 222 / Plan 222 / Implementation 222 / Evaluation 222	
Contemporary Ethical Issues	222
Informed Consent 222 / Determining Capacity 223 / Advance Directives 223 / End-of-Life Issues 224 / Resuscitation Decisions 227	
Building an Ethical Environment	227
Values Clarification 227 / Provide Information and Clarify Issues 227 / Recognize Moral Distress 228 / Engage in Collaborative Decision Making 228	
Selected Bibliography	228
Professional Codes, Standards, and Position Statements 229 / Evidence-Based Guidelines 229 / Online References of Interest: Related to Legal and Ethical Considerations 229	
Section II. Pathologic Conditions	231
9. Cardiovascular System	233
<i>Barbara Leeper</i>	
Special Assessment Techniques, Diagnostic Tests, and Monitoring Systems	233
Assessment of Chest Pain 233 / Coronary Angiography 233 / Percutaneous Coronary Interventions 234 / Other Percutaneous Coronary Interventions 235	

Pathologic Conditions	237
Acute Ischemic Heart Disease	237 / Heart Failure 247 / Shock 254 / Hypertension 258
Selected Bibliography	261
General Cardiovascular	261 / Coronary Revascularization 261 / Acute Ischemic Heart Disease 261 / Heart Failure 261 / Shock 262 / Hypertension 262 / Evidence-Based Practice Guidelines 262
10. Respiratory System	263
<i>Maureen A. Seckel</i>	
Special Assessment Techniques, Diagnostic Tests, and Monitoring Systems	263
Chest X-Rays	263 / Computed Tomography and Magnetic Resonance Imaging 268 / Pulmonary Angiograms, CTPA, and V/Q Scans 268 / Chest Tubes 269
Thoracic Surgery and Procedures	270
Principles of Management for Thoracic Surgery and Procedures	270
Pathologic Conditions	270
Acute Respiratory Failure	270 / Acute Respiratory Distress Syndrome (ARDS) 275 / Acute Respiratory Failure in the Patient with Chronic Obstructive Pulmonary Disease 277 / Acute Respiratory Failure in the Patient with Asthma (also called acute severe asthma) 280 / Principles of Management for Asthma Exacerbations 282 / Principles of Management for Acute Severe Asthma 282 / Pulmonary Hypertension 282 / Pneumonia 284 / Pulmonary Embolism 287
Selected Bibliography	290
Critical Care Management of Respiratory Problems	290 / Chest X-Ray Interpretation 290 / Miscellaneous 290 / Evidence-Based Practice Guidelines 290
11. Multisystem Problems	293
<i>Ruth M. Kleinpell</i>	
Pathologic Conditions	293
Sepsis and Multiple Organ Dysfunction Syndrome	293
Overdoses	300
Etiology, Risk Factors, and Pathophysiology	300
Complex Wounds and Pressure Ulcers	305
Pressure Ulcer Stages	305
Healthcare-Acquired Infections	306
Selected Infectious Diseases	307
Selected Bibliography	308
SIRS, Sepsis, and MODS	308 / Overdose 309 / Complex Wounds and Pressure Ulcers 309 / Healthcare-Acquired Infections 309 / Selected Infectious Diseases 310
12. Neurologic System	311
<i>Dea Mahanes</i>	
Special Assessment Techniques, Diagnostic Tests, and Monitoring Systems	311
Level of Consciousness	311 / Glasgow Coma Scale 312 / Full Outline of UnResponsiveness (FOUR) Score 313 / Mental Status 313 / Motor Assessment 315 / Sensation 316 / Cranial Nerve Assessment and Assessment of Brain Stem Function 316/ Vital Sign Alterations in Neurologic Dysfunction 318 / Death by Neurologic Criteria 319
Diagnostic Testing	319
Lumbar Puncture	319 / Computed Tomography 320 / Magnetic Resonance Imaging 320 / Cerebral (Catheter) Angiography 321 / Transcranial Doppler Ultrasound 321 / Electroencephalography 322 / Electromyography/Nerve Conduction Studies 322
Intracranial Pressure: Concepts and Monitoring	322
Cerebral Blood Flow	322 / Causes of Increased Intracranial Pressure 323 / Clinical Presentation 323 / Invasive Monitoring of ICP 324 / Principles of Management of Increased ICP 325
Acute Ischemic Stroke	327
Etiology, Risk Factors, and Pathophysiology	327 / Clinical Presentation 328 / Diagnostic Tests 329 / Principles of Management of Acute Ischemic Stroke 329
Hemorrhagic Stroke	331
Etiology, Risk Factors, and Pathophysiology	331 / Clinical Presentation 331 / Diagnostic Tests 332 / Principles of Management of Intracerebral Hemorrhage 332
Seizures	332
Etiology, Risk Factors, and Pathophysiology	332 / Clinical Presentation 332 / Diagnostic Testing 333 / Principles of Management of Seizures 333

Infections of the Central Nervous System	334
Meningitis 334 / Encephalitis 334 / Intracranial Abscess 334	
Neuromuscular Diseases	334
Myasthenia Gravis 335 / Guillain-Barré Syndrome 335	
Selected Bibliography	335
Assessment and Diagnostic Testing 335 / Intracranial Pressure 336 / Acute Ischemic Stroke and Hemorrhagic Stroke 336 / Seizures 336 / Infections of the Central Nervous System 336 / Neuromuscular Diseases 336 / Evidence-Based Practice 336	
13. Hematologic and Immune Systems.....	337
<i>Diane K. Dressler</i>	
Special Assessment Techniques, Diagnostic Tests, and Monitoring Systems	337
Complete Blood Count 337 / Red Blood Cell Count 337 / Hemoglobin 338 / Hematocrit 338 / Red Blood Cell Indices 338 / Total White Blood Cell Count 338 / White Blood Cell Differential 339 / Platelet Count 339 / Coagulation Studies 339 / Additional Tests and Procedures 340	
Pathologic Conditions	340
Anemia 340 / Immunocompromise 342 / Coagulopathies 344	
Selected Bibliography	348
Anemia 348 / Immunocompromised Patient 349 / Coagulopathy 349	
14. Gastrointestinal System	351
<i>Deborah A. Andris, Elizabeth Krzywda, Carol Rees Parrish, and Joe Krenitsky</i>	
Pathologic Conditions	351
Acute Upper Gastrointestinal Bleeding 351 / Liver Failure 359 / Acute Pancreatitis 364 / Intestinal Ischemia 366 / Bowel Obstruction 367 / Bariatric (Weight Loss) Surgery 369 / Surgical Procedure 369	
Nutritional Support for Critically Ill Patients	371
Nutritional Requirements 371 / Nutritional Case: Special Populations 371 / Gastric Residual Volume 372 / Aspiration 373 / Bowel Sounds 375 / Nausea and Vomiting 375 / Osmolality or Hypertonicity of Formula 375 / Diarrhea 376 / Flow Rates and Hours of Infusion 377 / Formula Selection 377	
Selected Bibliography	377
Upper GI Bleeding 377 / Liver Failure 378 / Acute Pancreatitis 378 / Intestinal Ischemia/Bowel Obstruction 378 / Nutrition 379 / Bariatric (Gastric Bypass) Surgery 380	
15. Renal System	383
<i>Carol Hinkle</i>	
Special Assessment Techniques, Diagnostic Tests, and Monitoring Systems	383
Pathologic Conditions	383
Acute Renal Failure 383 / Life-Threatening Electrolyte Imbalances 388	
Renal Replacement Therapy	393
Access 393 / Dialyzer/Hemofilters/Dialysate 394 / Procedures 394 / Indications for and Efficacy of Renal Replacement Therapy Modes 395 / General Renal Replacement Therapy Interventions 397	
Selected Bibliography	397
General Renal and Electrolytes 397 / Renal Failure 398 / Renal Replacement Therapy 398 / Web Resources 398	
16. Endocrine System.....	399
<i>Christine Kessler</i>	
Special Assessment Techniques, Diagnostic Tests, and Monitoring Systems	399
Blood Glucose Monitoring 399	
Pathologic Conditions	401
Hyperglycemic States 401 / Hyperglycemic Emergencies 402 / Acute Hypoglycemia 408 / Syndrome of Inappropriate Antidiuretic Hormone Secretion 409 / Diabetes Insipidus 411	
Selected Bibliography	413
Blood Glucose Monitoring 413 / Hyperglycemia, DKA, and HHS 413 / SIADH and Diabetes Insipidus 413	

17. Trauma	415
<i>Allen C. Wolfe and Benjamin W. Hughes</i>	
Specialized Assessment Techniques, Diagnostic Tests, and Monitoring Systems	415
Primary and Secondary Trauma Survey Assessment 415 / Diagnostic Studies 417 / Mechanism of Injury 418 / Physiologic Consequences of Trauma 421	
Common Injuries in the Trauma Patient	421
Thoracic Trauma 421 / Abdominal Trauma 423 / Musculoskeletal Trauma 425	
Complications of Traumatic Injury in Severe Multisystem Trauma	427
Acute Respiratory Distress Syndrome 428 / Infection/Sepsis 428 / Systemic Inflammatory Response Syndrome 428	
Psychological Consequences of Trauma	429
Selected Bibliography	430
General Trauma 430 / Selected Web sites 430 / Evidence-Based Practice 430	
Section III. Advanced Concepts in Caring for the Critically Ill Patient	431
18. Advanced ECG Concepts	433
<i>Carol Jacobson</i>	
The 12-lead Electrocardiogram	433
Axis Determination 437 / Bundle Branch Block 438 / Acute Coronary Syndrome 442 / Preexcitation Syndromes 448	
Advanced Arrhythmia Interpretation	452
Supraventricular Tachycardias 452 / Polymorphic Ventricular Tachycardias 456 / Differentiating Wide QRS Beats and Rhythms 458	
ST-Segment Monitoring	461
Measuring the ST Segment 461 / Choosing the Best Leads for ST-Segment Monitoring 461	
Cardiac Pacemakers	463
Evaluating Pacemaker Function 465 / VVI Pacemaker Evaluation 465 / DDD Pacemaker Evaluation 468	
Selected Bibliography	472
Evidence-Based Practice 473	
19. Advanced Cardiovascular Concepts	475
<i>Barbara Leeper</i>	
Pathologic Conditions	475
Cardiomyopathy 475 / Valvular Heart Disease 480 / Pericarditis 486 / Aortic Aneurysm 488 / Cardiac Transplantation 492 / Intra-Aortic Balloon Pump Therapy 497 / Ventricular Assist Devices 500	
Selected Bibliography	503
General Cardiovascular 503 / Cardiomyopathy 503 / Heart Transplantation 504 / Valvular Disorders 504 / Pericarditis 504 / Thoraco-Abdominal Aneurysms 504 / Intra-aortic Balloon Pump Therapy 504 / Ventricular Assist Devices 504 / Evidence-Based Practice/Guidelines 505	
20. Advanced Respiratory Concepts: Modes of Ventilation.....	507
<i>Suzanne M. Burns</i>	
Advanced Modes of Mechanical Ventilation	507
New Concepts: Mechanical Ventilation 507 / Volume Versus Pressure Ventilation 508 / Advanced Modes: What Do We Know? 514	
Selected Bibliography	515
Mechanical Ventilation: Modes 515 / Selected Vendor Web Pages 516 / Evidence-Based Practice 516 / Additional Readings 516	
21. Advanced Neurologic Concepts	517
<i>Dea Mahanes</i>	
Subarachnoid Hemorrhage	517
Etiology, Risk Factors, and Pathophysiology 517 / Clinical Presentation 517 / Diagnostic Tests 518 / Principles of Management of Aneurysmal-Subarachnoid Hemorrhage 519	

Traumatic Brain Injury 522
Etiology, Risk Factors, and Pathophysiology 522 / Clinical Presentation 525 / Diagnostic Tests 525 /
Principles of Management of Traumatic Brain Injury 526

Traumatic Spinal Cord Injury 528
Etiology, Risk Factors, and Pathophysiology 528 / Clinical Presentation 528 / Diagnostic Tests 530 /
Principles of Management of Acute Spinal Cord Injury 530 / Future Spinal Cord Injury Treatment 536

Brain Tumors 536
Etiology, Risk Factors, and Pathophysiology 536 / Clinical Presentation 536 / Diagnostic Tests 537 /
Principles of Management of Intracranial Tumors 537

Advanced Technology: Brain Tissue Oxygen Monitoring 538

Selected Bibliography 539
Subarachnoid Hemorrhage 539 / Traumatic Brain Injury 539 / Spinal Cord Injury 539 /
Brain Tumors 539 / Advanced Technology: Brain Tissue Oxygen Monitoring 539 / Evidence-Based
Guidelines 539

Section IV. Key Reference Information 541

22. Normal Values Table 543
Suzanne M. Burns

23. Pharmacology Tables 545
Earnest Alexander

24. Advanced Cardiac Life Support Algorithms..... 559
Suzanne M. Burns

25. Hemodynamic Troubleshooting Guide..... 563
Leanna R. Miller

26. Cardiac Rhythms, ECG Characteristics, and Treatment Guide..... 571
Carol Jacobson

Index 581

Acknowledgments

Special thanks to those who made contributions to the previous editions of both the *Essentials of Critical Care Nursing* and the *Essentials of Progressive Care Nursing*.

To Cathie Guzzetta RN, PhD, FAAN and Barbara Dosey RN, MS, FAAN for their early work in creating the *Handbook of Critical Care Nursing* which preceded the *Essentials of Critical Care Nursing* and the *Essentials of Progressive Care Nursing* books.

To Marianne Chulay RN, PhD, FAAN, my dear friend and colleague, for her many contributions and mentoring during the development of the first two editions of the *Essentials of Critical Care Nursing* and the *Essentials of Progressive Care Nursing* books. Her inspiration, drive, and thoughtful approach to the books continue to be an inspiration to me and the authors with whom she worked.

Thank you to the many authors for their past contributions:

Tom Ahrens, RNS, DNS, CCNS, FAAN (Chapter 4 and key reference materials)
Suzanne M. Burns, RN, MSN, RRT ACNP, CCRN, FAAN, FCCM, FAANP (Chapters 5, 11)
Deb Byram, RN, MS (Chapter 1)
Karen Carlson, RN, MN (Chapter 15)

Joan Michiko Ching, RN, MN, CPHQ (Chapter 6)
Marianne Chulay, RN, PhD, FAAN (Chapter 10, and the key reference materials)
Maria Connolly, RN, DNSc (Chapters 5, 10)
Dorrie Fontaine, RN, DNSc, FAAN (Chapter 17)
Bradi Granger, RN, PhD (Chapter 9)
Anne Marie Gregoire, RN, MSN, CRNP (Chapter 19)
Joanne Krumberger, RN, MSN, CHE, FAAN (Chapters 14, 16)
Sally Miller, RN, PhD, APN, FAANP (Chapter 14)
Carol A. Rauen, RN, MS, CCNS, CCRN, PCCN (Chapter 17)
Juanita Reigle, RN, MSN, ACNP (Chapter 8)
Anita Sherer, RN, MSN (Chapter 2)
Sue Simmons-Alling, RN, MSN (Chapter 2)
Jamie Sinks, RN, MS (Chapter 17)
Greg Susla, Pharm D, FCCM (Chapter 7 and key reference materials)
Debbie Tribett, RN, MS, CS, LNP (Chapter 13)
Debra Lynn-McHale Wiegand, RN, PhD, CS (Chapter 19)
Lorie Wild, RN, PhD (Chapter 6)
Susan Woods, PhD, RN (Chapters 3, 18)
Marlene Yates, RN, MSN (Chapter 2)

This page intentionally left blank

Contributors

Earnest Alexander, PharmD, FCCM

Assistant Director, Clinical Pharmacy Services
Program Director, PGY2 Critical Care Residency
Department of Pharmacy Services
Tampa General Hospital
Tampa, Florida
Chapter 7: Pharmacology
Chapter 23: Pharmacology Tables

Deborah A. Andris, MSN, APNP

Nurse Practitioner
Division of Colorectal Surgery
Medical College of Wisconsin
Milwaukee, Wisconsin
Chapter 14: Gastrointestinal System

Yvonne D'Arcy, MS, CRNP, CNS

Pain Management and Palliative Care Nurse Practitioner
Suburban Hospital-Johns Hopkins Medicine
Bethesda, Maryland
Chapter 6: Pain, Sedation, and Neuromuscular Blockade Management

Suzanne M. Burns, RN, MSN, RRT, ACNP, CCRN, FAAN, FCCM, FAANP

Professor Emeritus, School of Nursing University of Virginia
Consultant, Critical and Progressive Care and Clinical Nursing Research
Charlottesville, Virginia
Chapter 6: Pain, Sedation, and Neuromuscular Blockade Management
Chapter 20: Advanced Respiratory Concepts: Modes of Ventilation
Chapter 22: Normal Values Table
Chapter 24: Advanced Cardiac Life Support Algorithms

Sarah Delgado, RN, MSN, ACNP

Chronic Care Nurse Practitioner
PIH Health Physicians
Whittier, California
Chapter 8: Ethical and Legal Considerations

Diane K. Dressler, MSN, RN, CCRN

Clinical Assistant Professor
Marquette University College of Nursing
Milwaukee, Wisconsin
Chapter 13: Hematologic and Immune Systems

Carol Hinkle, MSN, RN-BC

Brookwood Medical Center
Birmingham, Alabama
Chapter 15: Renal System

Benjamin W. Hughes, RN, MSN, MS, CCRN

Director
Trauma Institute and Cardiopulmonary Services
University of Louisville Hospital
Louisville, Kentucky
Chapter 17: Trauma

Carol Jacobson, RN, MN

Director, Quality Education Services and Partner Cardiovascular Nursing Education Associates
Clinical Faculty
University of Washington School of Nursing
Seattle, Washington
Chapter 3: Interpretation and Management of Basic Cardiac Rhythms
Chapter 18: Advanced ECG Concepts
Chapter 24: Cardiac Rhythms, ECG Characteristics, and Treatment Guide
Chapter 26: Cardiac Rhythms, ECG Characteristics, and Treatment Guide

Christine Kessler, MN, CNS, ANP, BC-ADM

Nurse Practitioner, Diabetes Institute
Department of Endocrinology and Metabolic Medicine
Walter Reed Army Medical Center
Washington, DC
Chapter 16: Endocrine System

Ruth M. Kleinpell, PhD, RN-CS, FAAN, FCCM, FAANP, ACNP, CCRN

Director, Center for Clinical Research and Scholarship
Rush University Medical Center
Professor, Rush University College of Nursing
Nurse Practitioner, Our Lady of the Resurrection Medical Center
Chicago, Illinois
Chapter 11: Multisystem Problems

Joe Krenitsky, MS, RD

Nutrition Support Specialist
Digestive Health Center of Excellence
Department of Nutrition Services
University of Virginia Health System
Charlottesville, Virginia
Chapter 14: Gastrointestinal System

Elizabeth Krzywda, MSN, APNP

Nurse Practitioner
Pancreaticobiliary Surgery Program
Medical College of Wisconsin
Milwaukee, Wisconsin
Chapter 14: Gastrointestinal System

Barbara Leeper, MN, RN-BC, CNS-MS, CCRN, FAHA

Clinical Nurse Specialist
Cardiovascular Services
Baylor University Medical Center
Dallas, Texas
Chapter 9: Cardiovascular System
Chapter 19: Advanced Cardiovascular Concepts

Dea Mahanes, RN, MSN, CCRN, CNRN, CCNS

Advanced Practice Nurse 3
Clinical Nurse Specialist
Nerancy Neuro ICU
University of Virginia Health System
Charlottesville, Virginia
Chapter 12: Neurologic System
Chapter 21: Advanced Neurologic Concepts

Leanna R. Miller, RN, MN, CCRN-CMC, PCCN-CSC, CEN, CNRN, CMSRN, NP

Instructor
Western Kentucky University
Bowling Green, Kentucky
Chapter 4: Hemodynamic Monitoring
Chapter 25: Hemodynamic Troubleshooting Guide

Carol Rees Parrish, MS, RD

Nutrition Support Specialist
Digestive Health Center of Excellence
Department of Nutrition Services
University of Virginia Health System
Charlottesville, Virginia
Chapter 14: Gastrointestinal System

Robert E. St. John, MSN, RN, RRT

Covidien
Care Area Manager—US Patient Monitoring
Respiratory and Monitoring Solutions
Boulder, Colorado
Chapter 5: Airway and Ventilatory Management

Maureen A. Seckel, APN, ACNS, BC, CCNS, CCRN

Clinical Nurse Specialist Medical Pulmonary Critical Care
Christiana Care Health System
Newark, Delaware
Chapter 5: Airway and Ventilatory Management
Chapter 10: Respiratory System

Mary Fran Tracy, PhD, RN, CCNS, FAAN

Critical Care Clinical Nurse Specialist
University of Minnesota Medical Center, Fairview
Minneapolis, Minnesota
Chapter 1: Assessment of Critically Ill Patients and Their Families
Chapter 2: Planning Care for Critically Ill Patients and Their Families

Allen C. Wolfe, Jr., MSN, RN, CFRN, CCRN, CMTE

Clinical Education Director/Clinical Specialist
Air Methods Corporation
Community Based Services
Denver, Colorado
Chapter 17: Trauma

Reviewers

John M. Allen, PharmD, BCPS

Assistant Professor
Department of Pharmacotherapeutic and Clinical Research
University of South Florida College of Pharmacy
Tampa, Florida

Richard B. Arbour, MSN, RN, CCRN, CNRN, CCNS, FAAN

Liver Transplant Coordinator
Thomas Jefferson University Hospital
Advanced Practice Nurse/Educator/Researcher
Philadelphia, Pennsylvania

Cheri S. Blevins, MSN RN CCRN CCNS

APN-2 Clinical Nurse Specialist
Medical ICU
University of Virginia Health System
Charlottesville, Virginia

Shawn Cosper, MSN, RN

Education Consultant-Critical Care
Education Department
Brookwood Medical Center
Birmingham, Alabama

Sarah Jane White Craig, MSN, RN, CCNS, CCRN, CSC

Clinical Nurse Specialist
Postoperative Thoracic-Cardiovascular Surgery Service
University of Virginia Health System
Charlottesville, Virginia

Tina Cronin, APRN, CCNS, CCRN, CNRN

Senior Director Clinical Programs and Outcomes
Piedmont Medical Center
Rock Hill, South Carolina

Linda DeStefano, CNS, NP, FCCM

Clinical Nurse Specialist, Critical Care Services
Saddleback Memorial Medical Center
Laguna Hills, California

Beth Epstein, PhD, RN

Associate Professor
University of Virginia School of Nursing
Faculty Affiliate University of Virginia Center for
Biomedical Ethics and Humanities
University of Virginia
Charlottesville, Virginia

John J. Gallagher, MSN, RN, CCNS, CCRN, RRT

Trauma Program Manager
Division of Traumatology, Surgical Critical Care and
Emergency Surgery
Hospital of the University of Pennsylvania
Philadelphia, Pennsylvania

Tonja Hartjes, DNP, ACNP/FNP-BC, CCRN-CSC

Associate Clinical Professor
University of Florida, College of Nursing
Adult Gerontology and Acute Care ARNP Program
& Cardiothoracic Surgery ARNP Shands UF
Gainesville, Florida

Barbara S. Jacobs, MSN, RN-BC, CCRN, CENP

Senior Director/Chief Nurse Officer
Suburban Hospital
Bethesda, Maryland

Katherine Johnson, MS, CNRN, CCRN, CNS-BC

Neuroscience Clinical Nurse Specialist
The Queens Medical Center
Honolulu, Hawaii

Victoria A. Kark, RN, MSN, CCRN, CCNS, CSC

Clinical Nurse Specialist
SICU/MICU
Walter Reed National Military Medical Center
Bethesda, Maryland

Deborah Klein, MSN, RN, ACNS-BC, CCRN, CHF, FAHA
Clinical Nurse Specialist Coronary ICU, Heart Failure ICU,
and Cardiac Short Stay/PACU
Cleveland Clinic
Cleveland, Ohio

Julie Painter, RN, MSN, OCN
Community Health Network
Oncology Clinical Nurse Specialist
Indianapolis, Indiana

Carol A Rauen, RN, MS, CCNS, CCRN, PCCN, CEN
Independent Clinical Nurse Specialist and Education
Consultant
Kill Devil Hills, North Carolina

Christine Schulman, MS, RN, CNS, CCRN
Critical Care CNS
Legacy Health
Portland, Oregon

Michelle VanDemark, MSN, RN, ANP-BC, CNRN, CCSN
Neurocritical Care Nurse Practitioner
Sanford Medical Center
Sioux Falls, South Dakota

Michelle A. Weber, RN, MSN, ACNP-BC
Nurse Practitioner
Division of General Surgery
Medical College of Wisconsin
Milwaukee, Wisconsin

Brian Widmar, PhD, RN, ACNP-BC, CCRN-CSC-CMC
Assistant Professor of Nursing
Vanderbilt University School of Nursing
Nashville, Tennessee

Susan L. Woods, PhD, RN, FAAN
Professor Emerita
Department of Biobehavioral Nursing and Health Systems
School of Nursing
University of Washington
Seattle, Washington

Amanda Zomp, PharmD, BCPS
Critical Care Clinical Pharmacist
University of Virginia Medical Center
Charlottesville, Virginia

Preface

Critical care nursing is a complex, challenging area of nursing practice where clinical expertise is developed over time by integrating critical care knowledge, clinical skills, and caring practices. This textbook succinctly presents essential information about how best to safely and competently care for critically ill patients and their families.

As it has since the first edition, the American Association of Critical-Care Nurses reaffirms this book's value to the AACN community and especially to clinicians at the point of care. The title continues to carry AACN's name, as it has since the first edition.

AACN Essentials of Critical Care Nursing provides essential information on the care of adult critically ill patients and families. The book recognizes the learner's need to assimilate foundational knowledge before attempting to master more complex critical care nursing concepts. Written by nationally acknowledged clinical experts in critical care nursing, this book sets a new standard for critical care nursing education.

AACN Essentials of Critical Care Nursing represents a departure from the way in which most critical care books are written because it:

- Succinctly presents essential information for the safe and competent care of critically ill adult patients and their families, building on the clinician's significant medical-surgical nursing knowledge base, avoiding repetition of previously acquired information;
- Stages the introduction of advanced concepts in critical care nursing after essential concepts have been mastered;
- Provides clinicians with clinically-relevant tools and guides to use as they care for critically ill patients and families.

AACN Essentials of Critical Care Nursing is divided into four parts:

- **Part I: The Essentials** presents core information that clinicians must understand to provide safe, competent nursing care to all critically ill patients, regardless of their underlying medical diagnoses. This part includes

content on essential concepts of assessment, diagnosis, planning, and interventions common to critically ill patients and their families; interpretation and management of cardiac rhythms; hemodynamic monitoring; airway and ventilatory management; pain, sedation and neuromuscular blockade management; pharmacology; and ethical and legal considerations. Chapters in Part I present content in enough depth to ensure that essential information is available for the critical care clinician to develop competence, while sequencing pathological conditions in part II and advanced content in a later part of the book (Part III).

- **Part II: Pathologic Conditions** covers pathologic conditions and management strategies commonly encountered in critical care units, closely paralleling the blueprint for the CCRN certification examination. Chapters in this part are organized by body systems and selected critical care conditions, such as cardiovascular, respiratory, multisystem, neurologic, hematologic and immune, gastrointestinal, renal, endocrine, and trauma.
- **Part III: Advanced Concepts in Caring for the Critically Ill Patient** presents advanced critical care concepts or pathologic conditions that are more complex and represent expert level information. Specific advanced chapter content includes ECG concepts, cardiovascular concepts, respiratory concepts (ie, modes of ventilation), and neurologic concepts.
- **Part IV: Key Reference Information** contains reference information that clinicians will find helpful in the clinical area (normal laboratory and diagnostic values; algorithms for advanced cardiac life support; troubleshooting guides for hemodynamic monitoring; and summary tables of critical care drugs and cardiac rhythms). Content is presented primarily in table format for quick reference.

Each chapter in Part I, II, and III, begins with "Knowledge Competencies" that can be used to guide informal or formal teaching and to gauge the learner's progress. In addition,

each of the chapters provide “Essential Content Case” studies that focus on key information presented in the chapters in order to assist clinicians in understanding the chapter content and how to best assess and manage conditions and problems encountered in critical care. The case studies are also designed to enhance the learners understanding of the magnitude of the pathologic problems/conditions and their impact on patients and families. Questions and answers are provided for each case so the learner may test his/her knowledge of the essential content.

It is my belief that there is no greater way to protect our patients than to ensure that an educated clinician cares for them. Safe passage in critical care is ensured by competent, skilled, knowledgeable, and caring clinicians. I sincerely believe that this textbook will help you make it so!

Suzi Burns

THE ESSENTIALS



This page intentionally left blank

ASSESSMENT OF CRITICALLY ILL PATIENTS AND THEIR FAMILIES

1

Mary Fran Tracy

KNOWLEDGE COMPETENCIES

1. Discuss the importance of a consistent and systematic approach to assessment of critically ill patients and their families.
2. Identify the assessment priorities for different stages of a critical illness:
 - Prearrival assessment
 - Admission quick check
3. Describe how the assessment is altered based on the patient's clinical status.
 - Comprehensive admission assessment
 - Ongoing assessment

The assessment of critically ill patients and their families is an essential competency for critical care practitioners. Information obtained from an assessment identifies the immediate and future needs of the patient and family so a plan of care can be initiated to address or resolve these needs.

Traditional approaches to patient assessment include a complete evaluation of the patient's history and a comprehensive physical examination of all body systems. This approach, although ideal, rarely is possible in critical care as clinicians struggle with life-threatening problems during admission and must balance the need to gather data while simultaneously prioritizing and providing care. Traditional approaches and techniques for assessment must be modified in critical care to balance the need for information, while considering the critical nature of the patient and family's situation.

This chapter outlines an assessment approach that recognizes the emergent and dynamic nature of a critical illness. This approach emphasizes the collection of assessment data in a phased, or staged, manner consistent with patient care priorities. The components of the assessment can be used as a generic template for assessing most critically ill patients and families. The assessment can then be individualized by adding more specific assessment requirements depending on the

specific patient diagnosis. These specific components of the assessment are identified in subsequent chapters.

Crucial to developing competence in assessing critically ill patients and their families is a consistent and systematic approach to assessments. Without this approach, it would be easy to miss subtle signs or details that may identify an actual or potential problem and also indicate a patient's changing status. Assessments should focus first on the patient, then on the technology. The patient needs to be the focal point of the critical care practitioner's attention, with technology augmenting the information obtained from the direct assessment.

There are two standard approaches to assessing patients: the head-to-toe approach and the body systems approach. Most critical care nurses use a combination, a systems approach applied in a "top-to-bottom" manner. The admission and ongoing assessment sections of this chapter are presented with this combined approach in mind.

ASSESSMENT FRAMEWORK

Assessing the critically ill patient and family begins from the moment the nurse is made aware of the pending admission of the patient and continues until transitioning to the next

phase of care. The assessment process can be viewed as four distinct stages: (1) prearrival, (2) admission quick check (“just the basics”), (3) comprehensive initial, and (4) ongoing assessment.

Prearrival Assessment

A prearrival assessment begins the moment the information is received about the upcoming admission of the patient. This notification comes from the initial healthcare team contact. The contact may be paramedics in the field reporting to the emergency department (ED), a transfer from another facility, or a transfer from other areas within the hospital such as the emergency room (ER), operating room (OR), or medical/surgical nursing unit. The prearrival assessment paints the initial picture of the patient and allows the critical care nurse to begin anticipating the patient’s physiologic and psychological needs. This prearrival assessment also allows the critical care nurse to determine the appropriate resources that are needed to care for the patient. The information received in the prearrival phase is crucial because it allows the critical care nurse to adequately prepare the environment to meet the specialized needs of the patient and family.

Admission Quick Check

An admission quick check assessment is obtained immediately upon arrival and is based on assessing the parameters represented by the ABCDE acronym (Table 1-1). The admission quick check assessment is a quick overview of the adequacy of ventilation and perfusion to ensure early intervention for any life-threatening situations. Energy is also focused on exploring the chief complaint and obtaining essential diagnostic tests to supplement physical assessment findings. The admission quick check is a high-level view of the patient but is essential because it validates that basic cardiac and respiratory function is sufficient.

Comprehensive Initial Assessment

A comprehensive initial assessment is performed as soon as possible, with the timing dictated by the degree of physiologic stability and emergent treatment needs of the patient. If the patient is being admitted directly to the intensive care unit (ICU) from outside the hospital, the comprehensive assessment is an in-depth assessment of the past medical and social history and a complete physical examination of each body system. If the patient is being transferred to the ICU

from another area in the hospital, the comprehensive assessment includes a review of the admission assessment data and comparison to the current state of the patient. The comprehensive assessment is vital to successful outcomes because it provides the nurse invaluable insight into proactive interventions that may be needed.

Ongoing Assessment

After the baseline comprehensive initial assessment is completed, ongoing assessments, an abbreviated version of the comprehensive initial assessment, are performed at varying intervals. The assessment parameters outlined in this section are usually completed for all patients, in addition to other ongoing assessment requirements related to the patient’s specific condition, treatments, and response to therapy.

Patient Safety Considerations in Admission Assessments

Admission of an acutely ill patient can be a chaotic and fast-paced event with multiple disciplines involved in many activities. It is at this time, however, that healthcare providers must be particularly cognizant of accurate assessments and data gathering to ensure the patient is cared for safely with appropriate interventions. Obtaining inaccurate information on admission can lead to ongoing errors that may not be easily rectified or discovered and lead to poor patient outcomes.

Obtaining information from an acutely ill patient may be difficult, if possible at all. If the patient is unable to supply information, other sources must be utilized such as family members, electronic health records (EHRs), past medical records, transport records, or information from the patient’s belongings. Of particular importance at admission is obtaining accurate patient identification, as well as past medical history including any known allergies. Current medication regimens are extremely helpful if feasible, as they can provide clues to the patient’s medical condition and perhaps contributing factors to the current condition.

With the increasing use of EHRs, opportunities are improving for timely access to past and current medical histories of patients. Critical care providers may have access to both inpatient and outpatient records within the same healthcare system, assisting them in quickly identifying the patient’s most recent medication regimen and laboratory and diagnostic results. In addition, many healthcare systems within the same geographic locations are working together to make access available to intersystem medical records of patients being treated at multiple healthcare institutions. This is particularly beneficial in the intensive care setting where patients may be unable to articulate imperative medical information, including advance directives, allergies, and next of kin.

Careful physical assessment on admission to the critical care unit is pivotal for providing prevention and/or early treatment for complications associated with critical illness. Of particular importance is the assessment of risk for pressure

TABLE 1-1. ABCDE ACRONYM

Airway
Breathing
Circulation, Cerebral perfusion, and Chief complaint
Drugs and Diagnostic tests
Equipment

ulcer formation, alteration in mental status, and/or falls. Risks associated with accurate patient identification never lessen, particularly as these relate to interventions such as performing invasive procedures, medication administration, blood administration, and obtaining laboratory tests. Nurses need to be cognizant of safety issues as treatment begins as well. For example, accurate programming of pumps infusing high-risk medications is essential. It is imperative that nurses use all safety equipment available to them such as preprogrammed drug libraries in infusion pumps and bar-coding technology. Healthcare providers must also ensure the safety of invasive procedures that may be performed emergently.

PREARRIVAL ASSESSMENT: BEFORE THE ACTION BEGINS

A prearrival assessment begins when information is received about the pending arrival of the patient. The prearrival report, although abbreviated, provides key information about the chief complaint, diagnosis, or reason for admission, pertinent history details, and physiologic stability of the patient (Table 1-2). It also contains the gender and age of the patient and information on the presence of invasive tubes and lines, medications being administered, other ongoing treatments,

and pending or completed laboratory or diagnostic tests. It is also important to consider the potential isolation requirements for the patient (eg, neutropenic precautions or special respiratory isolation). Being prepared for isolation needs prevents potentially serious exposures to the patient or the healthcare providers. This information assists the clinician in anticipating the patient’s physiologic and emotional needs prior to admission and in ensuring that the bedside environment is set up to provide all monitoring, supply, and equipment needs prior to the patient’s arrival.

Many critical care units have a standard room setup, guided by the major diagnosis-related groups of patients each unit receives. The standard monitoring and equipment list for each unit varies; however, there are certain common requirements (Table 1-3). The standard room setup is modified for each admission to accommodate patient-specific needs (eg, additional equipment, intravenous [IV] fluids, medications). Proper functioning of all bedside equipment should be verified prior to the patient’s arrival.

It is also important to prepare the medical record, which usually consists of a manual flow sheet or computerized data entry system to record vital signs, intake and output, medication administration, patient care activities, and patient assessment. The prearrival report may suggest pending procedures, necessitating the organization of appropriate supplies at the bedside. Having the room prepared and all equipment available facilitates a rapid, smooth, and safe admission of the patient. If the ICU is partnering in a tele-ICU (e-ICU) model, inform the tele-ICU hub of the pending admission so they can also prepare to begin surveillance of the critically ill patient upon arrival.

Consider and plan for the fact that family members often arrive with the patient or even prior to the patient’s arrival in the ICU. Designate a healthcare worker who will connect with family members on their arrival by answering questions, giving them a brief orientation to the unit, showing them to a place where they can comfortably wait, providing them specific information as to when they will be able to see their loved one, and offering support resources.

TABLE 1-2. SUMMARY OF PREARRIVAL AND ADMISSION QUICK CHECK ASSESSMENTS

<p>Prearrival Assessment</p> <ul style="list-style-type: none"> Abbreviated report on patient (age, gender, chief complaint, diagnosis, pertinent history, physiologic status, invasive devices, equipment, and status of laboratory/diagnostic tests) Allergies Complete room setup, including verification of proper equipment functioning <p>Admission Quick Check Assessment</p> <ul style="list-style-type: none"> General appearance (consciousness) Airway: <ul style="list-style-type: none"> Patency Position of artificial airway (if present) Breathing: <ul style="list-style-type: none"> Quantity and quality of respirations (rate, depth, pattern, symmetry, effort, use of accessory muscles) Breath sounds Presence of spontaneous breathing Circulation and Cerebral Perfusion: <ul style="list-style-type: none"> ECG (rate, rhythm, and presence of ectopy) Blood pressure Peripheral pulses and capillary refill Skin, color, temperature, moisture Presence of bleeding Level of consciousness, responsiveness Chief Complaint: <ul style="list-style-type: none"> Primary body system Associated symptoms Drugs and Diagnostic Tests: <ul style="list-style-type: none"> Drugs prior to admission (prescribed, over-the-counter, illicit) Current medications Review diagnostic test results Equipment: <ul style="list-style-type: none"> Patency of vascular and drainage systems Appropriate functioning and labeling of all equipment connected to patient
--

TABLE 1-3. EQUIPMENT FOR STANDARD ROOM SETUP

<ul style="list-style-type: none"> Bedside ECG and invasive pressure monitor with appropriate cables ECG electrodes Blood pressure cuff Pulse oximetry Suction gauges and canister setup Suction catheters Bag-valve-mask device Oxygen flowmeter, appropriate tubing, and appropriate oxygen delivery device IV poles and infusion pumps Bedside supply cart that contains such things as alcohol swabs, nonsterile gloves, syringes, chux, and dressing supplies Admission kit that usually contains bath basin and general hygiene supplies Admission and critical care paper and/or electronic documentation forms
--

ADMISSION QUICK CHECK ASSESSMENT: THE FIRST FEW MINUTES

From the moment the patient arrives in the ICU setting, his or her general appearance is immediately observed and assessment of ABCDEs is quickly performed (see Table 1-1). On arrival, verify any urgent changes in patient condition or equipment in use since the prearrival report. The seriousness of the problem(s) is determined so that life-threatening emergent needs can be addressed first. The patient is connected to the appropriate monitoring and support equipment, critical medications are administered, and essential laboratory and diagnostic tests are ordered. Simultaneous with the ABCDE assessment, the nurse must validate that the patient is appropriately identified through a hospital wristband, personal identification, or family identification. In addition, the patient's allergy status is determined, including the type of reaction that occurs and what, if any, treatment is used to alleviate the allergic response.

There may be other healthcare professionals present to receive the patient and assist with admission tasks. The critical care nurse, however, is the leader of the receiving team. While assuming the primary responsibility for assessing the ABCDEs, the patient's nurse directs the team in completing delegated tasks, such as changing over to the ICU equipment or attaching monitoring cables. Without a leader of the receiving team, care can be fragmented and vital assessment clues overlooked.

The critical care nurse rapidly assesses the ABCDEs in the sequence outlined in this section. If any aspect of this

ESSENTIAL CONTENT CASE

Prearrival Assessment

The charge nurse notifies Sue that she will be receiving a 26-year-old man from the ER who was involved in a serious car accident. The ED nurse caring for the patient has called to give Sue a report following the hospital's standardized report format.

The patient was an unrestrained driver in a low-speed head-on collision and has sustained a closed-head injury and chest trauma with collapsed left lung. The patient was intubated and placed on a mechanical ventilator. IV access had been obtained, and a left chest tube had been inserted. The ED nurse provides the latest trend of the patient's vital signs and neurologic assessments and how he has responded to the administered pain medication. After a computed tomographic (CT) scan of the head, chest, and abdomen is obtained, the patient will be transferred to the ICU. Sue questions the ED nurse regarding whether the patient has been agitated, had a Foley catheter and nasogastric tube placed, and whether family had been notified of the accident.

Sue goes to check the patient's room prior to admission and begins to do a mental check of what will be needed. "The patient is intubated so I'll connect the AMBU bag to the oxygen source, check for suction

catheters, and make sure the suction systems are working. The pulse oximetry and the ventilator are ready to go. I have an extra suction gauge to connect to the chest tube system. I'll also turn on the ECG monitor and have the ECG electrodes ready to apply. An arterial line kit is at the bedside, and the flush system and transducer are also ready to be connected. The IV infusion devices are set up. This patient has an altered LOC, which means frequent neuro checks and potential insertion of an ICP catheter for monitoring. I have my pen light handy, but I better check to see if we have all the equipment to insert the ICP catheter in case the physician wants to perform the procedure here after the CT scan. The computer in the room is on and ready for me to begin documentation. I think I'm ready."

Case Question 1: What basic information will Sue want to know from the prearrival communication with the ED nurse?

Case Question 2: What patient issues are likely to need immediate assessment and/or intervention on arrival to the ICU in order to ensure the appropriate equipment is set up in the room?

Case Question 3: What information should be included in the more formal handoff between the ED nurse and Sue after the patient is settled in the ICU?

Answers

1. Patient name/age; type and timing of accident; extent of accident injuries; pertinent medical history, allergies, vital signs, and significant assessment information; placement of tubes and lines; medications being administered; significant laboratory results; anticipated plan on admission; presence of family; and any other special instructions.
2. Vital signs, neurologic status, and information such as whether the ventilator is adequately addressing the patient's ventilation needs, medications are appropriately infusing, and whether the patient is agitated or experiencing extensive pain.
3. Using an SBAR (situation-background-assessment-recommendation) format, the ED nurse can give more detailed information about the injuries from the car accident; the patient's complete medical history as known; reiteration of known allergies; a system by system assessment review; diagnostic test results; confirmation of all invasive lines and equipment settings; the anticipated plan for ongoing assessments and interventions; and any pertinent family information. Sue should also have an opportunity to ask any clarifying questions she might have.

preliminary assessment deviates from normal, interventions are immediately initiated to address the problem before continuing with the admission quick check assessment. Additionally, regardless of whether the patient appears to be conscious or not, it is important to talk to him or her throughout this admission process regarding what is occurring with each interaction and intervention.

Airway and Breathing

Patency of the patient's airway is verified by having the patient speak, watching the patient's chest rise and fall, or

both. If the airway is compromised, verify that the head has been positioned properly to prevent the tongue from occluding the airway. Inspect the upper airway for the presence of blood, vomitus, and foreign objects before inserting an oral airway if one is needed. If the patient already has an artificial airway, such as a cricothyrotomy, endotracheal (ET) tube, or tracheostomy, ensure that the airway is secured properly. Note the position of the ET tube and size marking on the ET tube that is closest to the teeth, lips, or nares to assist future comparisons for proper placement. Suctioning of the upper airway, either through the oral cavity or artificial airway, may be required to ensure that the airway is free from secretions. Note the amount, color, and consistency of secretions removed.

Note the rate, depth, pattern, and symmetry of breathing; the effort it is taking to breathe; the use of accessory muscles; and, if mechanically ventilated, whether breathing is in synchrony with the ventilator. Observe for nonverbal signs of respiratory distress such as restlessness, anxiety, or change in mental status. Auscultate the chest for presence of bilateral breath sounds, quality of breath sounds, and bilateral chest expansion. Optimally, both anterior and posterior breath sounds are auscultated, but during this admission quick check assessment, time generally dictates that just the anterior chest is assessed. If noninvasive oxygen saturation monitoring is available, observe and quickly analyze the values. If the patient is receiving assistive breaths from a bag-valve-mask or mechanical ventilator, note the presence of spontaneous breaths and evaluate whether ventilation requires excessive pressure and whether the patient's breathing appears comfortable and synchronized with the ventilator.

If chest tubes are present, note whether they are pleural or mediastinal chest tubes. Ensure that they are connected to suction, if appropriate, and are not clamped or kinked. In addition, assess whether they are functioning properly (eg, air leak, fluid fluctuation with respiration) and review the amount and character of the drainage.

Circulation and Cerebral Perfusion

Assess circulation by quickly palpating a pulse and viewing the electrocardiogram (ECG) monitor for the heart rate, rhythm, and presence of ectopy. Obtain blood pressure and temperature. Assess peripheral perfusion by evaluating the color, temperature, and moisture of the skin along with capillary refill. Based on the prearrival report and reason for admission, there may be a need to inspect the body for any signs of blood loss and determine if active bleeding is occurring.

Evaluating cerebral perfusion in the admission quick check assessment is focused on determining the functional integrity of the brain as a whole, which is done by rapidly evaluating the gross level of consciousness (LOC). Evaluate whether the patient is alert and aware of his or her surroundings, whether it takes a verbal or painful stimulus to obtain

a response, or whether the patient is unresponsive. Observing the response of the patient during movement from the stretcher to the ICU bed can supply additional information about the LOC. Note whether the patient's eyes are open and watching the events around him or her. For example, does the patient follow simple commands such as "Place your hands on your chest" or "Slide your hips over"? If the patient is unable to talk because of trauma or the presence of an artificial airway, note whether his or her head nods appropriately to questions.

Chief Complaint

Optimally, the description of the chief complaint is obtained from the patient, but this may not be realistic. The patient may be unable to respond or may not speak English. Data may need to be gathered from family, friends, bystanders, and prehospital personnel. If the patient or family cannot speak English, an approved hospital translator should be contacted to help with the interview and subsequent evaluations and communication. It is not recommended that family or friends are used to translate for a non-English speaking patient in order to protect the patient's privacy, to avoid the likelihood that family will not understand appropriate medical terminology for translation, and to eliminate well-intentioned but potential bias in translating back and forth for the patient. In the absence of a history source, practitioners must depend exclusively on the physical findings (eg, presence of medication patches, permanent pacemaker, or old surgery scars), knowledge of pathophysiology, and access to prior paper, electronic medical records (EMRs), or transport records to identify the potential causes of the admission.

Assessment of the chief complaint focuses on determining the body systems involved and the extent of associated symptoms. Additional questions explore the time of onset, precipitating factors, and severity. Although the admission quick check phase is focused on obtaining a quick overview of the key life-sustaining systems, a more in-depth assessment of a particular system may need to be done at this time. For example, in the prearrival case study scenario presented, completion of the ABCDEs is followed quickly by more extensive assessment of both the nervous and respiratory systems.

Drugs and Diagnostic Tests

Information about drugs and diagnostic tests is integrated into the priority of the admission quick check. If IV access is not already present, it should be immediately obtained and intake and output records started. If IV medications are presently being infused, check the drug(s) and verify the correct infusion of the desired dosage and rate.

Obtain critical diagnostic tests. Augment basic screening tests (Table 1-4) by additional tests appropriate to the underlying diagnosis and chief complaint. Review any available laboratory or diagnostic data for abnormalities or indications of potential problems requiring immediate intervention.

TABLE 1-4. COMMON DIAGNOSTIC TESTS OBTAINED DURING ADMISSION QUICK CHECK ASSESSMENT

Serum electrolytes
Glucose
Complete blood count with platelets
Coagulation studies
Arterial blood gases
Chest x-ray
ECG

The abnormal laboratory and diagnostic data for specific pathologic conditions will be covered in subsequent chapters.

Equipment

Quickly evaluate all vascular and drainage tubes for location and patency, and connect them to appropriate monitoring or suction devices. Note the amount, color, consistency, and odor of drainage secretions. Verify the appropriate functioning of all equipment attached to the patient and label as required. While connecting the monitoring and care equipment, it is imperative that the nurse continue to assess the patient's respiratory and cardiovascular status until it is clear that all equipment is functioning appropriately and can be relied on to transmit accurate patient data.

The admission quick check assessment is accomplished in a matter of a few minutes. After completion of the ABCDEs assessment, the comprehensive initial assessment begins. If at any phase during the admission quick check a component of the ABCDEs has not been stabilized and controlled, energy is focused first on resolving the abnormality before proceeding to the comprehensive admission assessment.

After the admission quick check assessment is complete, and if the patient requires no urgent intervention, there may now be time for a more thorough report from the healthcare providers transferring the patient to the ICU. It is important to note that handoffs with transitions of care are possible intervals when safety gaps may occur. Omission of pertinent information or miscommunication at this critical juncture can result in patient care errors. Use of a standardized handoff format, such as the SBAR format, can minimize the potential for miscommunication. Use the handoff as an opportunity to confirm observations such as dosage of infusing medications, abnormalities found on the quick check assessment, independent double check and confirmation of equipment settings, and any potential inconsistencies noted between your assessment and the prearrival report. It is easier to clarify questions while the transporters are still present if possible.

This may also be an opportunity for introductory interactions with family members or friends, if present. Introduce yourself, offer reassurance, and confirm the intention to give the patient the best care possible (Table 1-5). If feasible, allow them to briefly see the patient. If this is not feasible, give them an approximate time frame when they can expect to

TABLE 1-5. EVIDENCE-BASED PRACTICE: FAMILY NEEDS ASSESSMENT

Quick Assessment
• Offer realistic hope
• Give honest answers and information
• Give reassurance
Comprehensive Assessment
• Use open-ended communication and assess their communication style
• Assess family members' level of anxiety
• Assess perceptions of the situation (knowledge, comprehension, expectations of staff, expected outcome)
• Assess family roles and dynamics (cultural and religious practices, values, spokesperson)
• Assess coping mechanisms and resources (what do they use, social network and support)

receive an update from you on the patient's condition. Have another member of the healthcare team escort them to the appropriate waiting area.

COMPREHENSIVE INITIAL ASSESSMENT

Comprehensive initial assessments determine the physiologic and psychosocial baseline so that future changes can be compared to determine whether the status is improving or deteriorating. The comprehensive initial assessment also defines the patient's pre-event health status, determining problems or limitations that may impact patient status during this admission as well as potential issues for future transitioning of care. The content presented in this section is a template to screen for abnormalities or determine the extent of injury to the patient. Any abnormal findings or changes from baseline warrant a more in-depth evaluation of the pertinent system.

The comprehensive initial assessment includes review of the patient's medical and brief social history, and physical examination of each body system. The comprehensive admission assessment of the critically ill patient is similar to admission assessments for noncritically ill patients. This section describes only those aspects of the assessment that are unique to critically ill patients or require more extensive information than is obtained from a non-critical care patient. The entire assessment process is summarized in Tables 1-6 and 1-7.

Changing demographics of critical care units indicate that an increasing proportion of patients are elderly, requiring assessments to incorporate the effects of aging. Although assessment of the aging adult does not differ significantly from that of younger adults, understanding how aging alters the physiologic and psychological status of the patient is important. Key physiologic changes pertinent to the critically ill elderly adult are summarized in Table 1-8. Additional emphasis must also be placed on the past medical history because the aging adult frequently has multiple coexisting illnesses and is taking several prescriptive and over-the-counter medications. Social history includes addressing issues related to home environment, support systems, and self-care abilities. The interpretation of clinical findings in the elderly must also take into consideration the fact that the

TABLE 1-6. SUMMARY OF COMPREHENSIVE ADMISSION ASSESSMENT REQUIREMENTS

Past Medical History
<ul style="list-style-type: none"> • Medical conditions, surgical procedures • Psychiatric/emotional problems • Hospitalizations • Medications (prescription, over-the-counter, illicit drugs) and time of last medication dose • Allergies • Review of body systems (see Table 1-7)
Social History
<ul style="list-style-type: none"> • Age, gender • Ethnic origin • Height, weight • Highest educational level completed • Occupation • Marital status • Primary family members/significant others/decision makers • Religious affiliation • Advance Directive and Durable Power of Attorney for Health Care • Substance use (alcohol, drugs, caffeine, tobacco) • Domestic abuse or vulnerable adult screen
Psychosocial Assessment
<ul style="list-style-type: none"> • General communication • Coping styles • Anxiety and stress • Expectations of critical care unit • Current stresses • Family needs
Spirituality
<ul style="list-style-type: none"> • Faith/spiritual preference • Healing practices
Physical Assessment
<ul style="list-style-type: none"> • Nervous system • Cardiovascular system • Respiratory system • Renal system • Gastrointestinal system • Endocrine, hematologic, and immune systems • Integumentary system

coexistence of several disease processes and the diminished reserves of most body systems often result in more rapid physiologic deterioration than in younger adults.

Past Medical History

Besides the primary event that brought the patient to the hospital, it is important to determine prior medical and surgical conditions, hospitalization, medications, and symptoms (see Table 1-7). In reviewing medication use, ensure assessment of over-the-counter medication use as well as any herbal or alternative supplements. For every positive symptom response, additional questions should be asked to explore the characteristics of that symptom (Table 1-9).

Social History

Inquire about the use and abuse of caffeine, alcohol, tobacco, and other substances. Because the use of these agents can

have major implications for the critically ill patient, questions are aimed at determining the frequency, amount, and duration of use. Honest information regarding alcohol and substance abuse, however, may not be always forthcoming. Alcohol use is common in all age groups. Phrasing questions about alcohol use by acknowledging this fact may be helpful in obtaining an accurate answer (eg, “How much alcohol do you drink?” vs “Do you drink alcohol and how much?”). Family or friends might provide additional information that might assist in assessing these parameters. The information revealed during the social history can often be verified during the physical assessment through the presence of signs such as needle track marks, nicotine stains on teeth and fingers, or the smell of alcohol on the breath.

Patients should also be asked about physical and emotional safety in their home environment in order to uncover potential domestic or elder abuse. It is best if patients can be assessed for vulnerability when they are alone to prevent placing them in a position of answering in front of family members or friends who may be abusive. Ask questions such as “Is anyone hurting you?” or “Do you feel safe at home?” in a nonthreatening manner. Any suspicion of abuse or vulnerability should result in a consultation with a social worker to determine additional assessments.

Physical Assessment by Body System

The physical assessment section is presented in the sequence in which the combined system, head-to-toe approach is followed. Although content is presented as separate components, generally the history questions are integrated into the physical assessment. The physical assessment section uses the techniques of inspection, auscultation, and palpation. Although percussion is a common technique in physical examinations, it is infrequently used in critically ill patients.

Pain assessment is generally linked to each body system rather than considered as a separate system category. For example, if the patient has chest pain, assessment and documentation of that pain is incorporated into the cardiovascular assessment. Rather than have general pain assessment questions repeated under each system assessment, they are presented here.

Pain and discomfort are clues that alert both the patient and the critical care nurse that something is wrong and needs prompt attention. Pain assessment includes differentiating acute from chronic pain, determining related physiologic symptoms, and investigating the patient’s perceptions and emotional reactions to the pain. Explore the qualities and characteristics of the pain by using the questions listed in Table 1-9. Pain is a very subjective assessment and critical care practitioners sometimes struggle with applying their own values when attempting to evaluate the patient’s pain. To resolve this dilemma, use the patient’s own words and descriptions of the pain whenever possible and use a patient-preferred pain scale (see Chapter 6, Pain, Sedation, and Neuromuscular Blockade Management) to objectively and