Respiratory Critical Care

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To all respiratory therapists who go beyond the traditional roles of RT and willingly work with other critical care clinicians for better patient care and outcomes.

—David W. Chang

To my wife, Carolyn, who has supported my writing avocation for over 33 years.

—Gary C. White

To my wife, Linda, and my children, Alia, Ian, and Adria, who support me with their love. To my past and future students who motivate me to learn. And to my dear Lord Jesus, who makes everything possible.

—Jonathan B. Waugh

To my amazing "best half," Diana, a respiratory therapist and great educator who has supported me on every project. To my three princesses, Andrea, Natalia, and Valentina. They know well that this book has been on my bucket list for years.

—Ruben D. Restrepo

Brief Contents

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Preface

Since the inception of mechanical ventilation, the roles of respiratory therapists (clinicians) in critical care settings have changed a great deal. The days of performing "vent checks" and "ABGs" as the primary tasks are gone forever. Instead, respiratory therapists are expected to perform as a member of the critical care team. They must be able to select useful clinical data, perform appropriate patient assessments, and communicate the findings to the physician and other critical care clinicians. For these reasons, all critical care clinicians should have a fundamental and solid knowledge of mechanical ventilation, critical care procedures, pharmacotherapy in critical care, medical and trauma critical care issues, and current clinical practice guidelines pertaining to critical care.

There are 15 chapters in this new text. Nine chapters focus on the key elements of mechanical ventilation, ranging from principles of mechanical ventilation to weaning from mechanical ventilation. One chapter covers the fundamentals of neonatal and pediatric mechanical ventilation. The other five chapters cover a broad range of critical care topics: critical care procedures, pharmacotherapy in critical care, medical critical care issues, traumatic critical care issues, life support, and clinical practice guidelines.

The primary audience of this text is respiratory therapy students. This text has incorporated the essential content in the Therapist Multiple-Choice (TMC) and Adult Critical Care Specialty (ACCS) exam matrices by the National Board for Respiratory Care (NBRC). This text is also a useful resource guide and quick reference for clinicians caring for critically ill patients. It is my intent that this new text will help broaden the traditional roles of respiratory therapy in the critical care settings. More important, a knowledgeable and cohesive critical care team will deliver evidence-based patient care and produce better patient outcomes.

David W. Chang, EdD, RRT

How to Use This Book

- Each chapter of the book begins with a list of **Objectives** to help you focus on the most important concepts in that chapter.
- **Tables** are used to highlight important information, such as **Table 8-15** "Characteristics and Recovery Time for First-, Second-, and Third-Degree Burns."

TABLE 8-15
Characteristics and Recovery Time for First-, Second-, and Third-Degree Burns

Degree of Burn	Characteristic	Recovery
First-degree burn	Reddening of the skin surface Patient feels pain	Within days
Second-degree superficial dermal burn	Blister; dermis below blister is red Patient feels pain	1–2 weeks
Second-degree deep dermal burn	Blister; dermis below blister is white and anemic Patient may not feel pain	3–4 weeks
Third-degree burn	Necrosis through the dermis; white or brown leatherlike appearance or completely charred skin Patient does not feel pain	Up to 3 months

- This text is highly **illustrated** with diagrams and photos demonstrating a variety of concepts, such as the illustration of sniffing position in **Figure 4-18**.

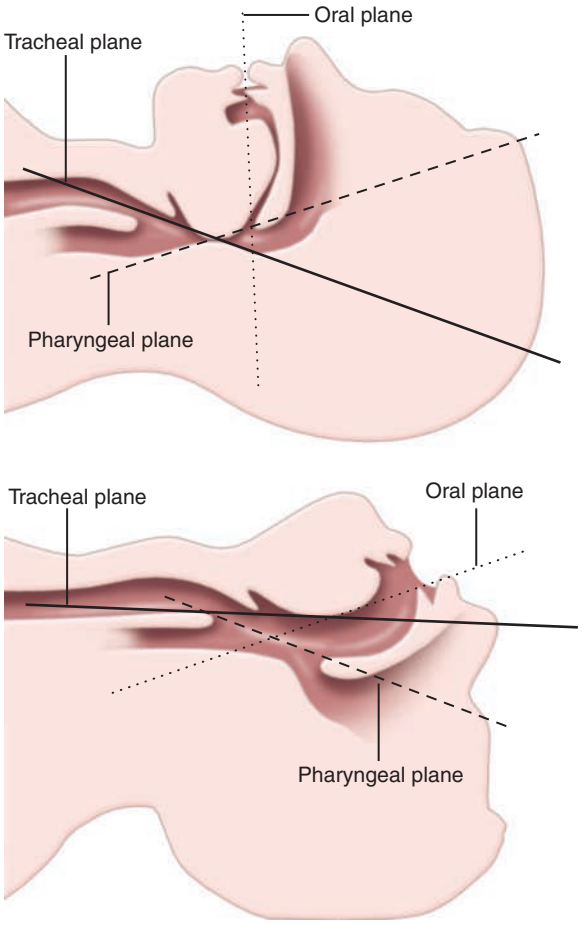

FIGURE 4-18 Sniffing position.

- Throughout the text, **Boxes** highlight key points and important information, to ensure comprehension and to aid the study of critical materials.

BOX 6-9 Calculation of SVR

$$SVR = \frac{(MAP - CVP) \times 80}{CO}$$

CO, cardiac output; CVP, central venous pressure; MAP, mean arterial pressure; SVR, systemic vascular resistance.

- Every chapter concludes with a **Case Study** to help readers review and put into practice what they have learned.

CASE STUDY

Mr. King, a patient with chronic obstructive pulmonary disease (COPD) in severe respiratory distress, is picked up by an ambulance. During transport and upon arrival at the hospital, he is receiving noninvasive ventilation via an oronasal mask. Patient assessment shows patient-ventilator dyssynchrony. Mr. King is complaining of "not getting enough air."

1. **What is the cycle mechanism of this noninvasive ventilator?**
2. **What can be done to provide more ventilation to the patient?**

Mr. King is subsequently admitted to the intensive care unit (ICU) for acute exacerbation of COPD and severe hypoxemia. He is intubated and placed on volume-controlled ventilation.

3. **What is the cycling mechanism of this type of mechanical ventilation?**
4. **The physician orders positive end-expiratory pressure (PEEP) of 5 cm H_2O for Mr. King. What type of ventilator variable is PEEP?**
5. **What is the primary reason for applying this baseline variable?**

Instructor and Student Resources

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- Comprehensive, chapter-by-chapter slides in PowerPoint format
- A Test Bank containing questions on a chapter-by-chapter basis
- Answers to the Case Studies

For the Student

- Case Studies are embedded into the eBook as writeable PDFs
- Concept Maps are available online and break down key concepts within every chapter

About the Authors

David W. Chang, EdD, RRT is a Professor for the Department of Cardiorespiratory Care at the University of South Alabama, Mobile. Over the years, he has served in different capacities in the American Association for Respiratory Care (AARC), Commission on Accreditation for Respiratory Care (CoARC), and National Board for Respiratory Care (NBRC). He has published many textbooks, including *Respiratory Care Calculations* and *Clinical Application of Mechanical Ventilation.*

Gary C. White, MEd, RRT, RPFT, FAARC is Program Director of Respiratory Therapy at Spokane Community College (Washington). He has served as a board member and in many other capacities in the Commission on Accreditation for Respiratory Care (CoARC). He has published many textbooks, including *Basic Clinical Lab Competencies for Respiratory Care: An Integrated Approach* and *Equipment Theory for Respiratory Care.*

Jonathan B. Waugh, PhD, RRT, RPFT, FAARC is a Professor for the Respiratory Therapy program at Liberty University in Lynchburg, Virginia. He received a BS in Respiratory Therapy from the Cardiopulmonary Sciences program at the University of Central Florida in 1985. He earned an MS in Health Science (1990) and a PhD in Cardiopulmonary Sciences (1994) from The Ohio State University. He conducts research in ventilatory monitoring, capnography, high-flow therapy, medical device testing, and tobacco prevention and treatment.

Ruben D. Restrepo, MD, RRT is a Tenured Professor and Coordinator of Research for the Division of Respiratory Care at the University of Texas Health Science Center in San Antonio. He earned his diploma as Physician and Surgeon from Colombia, South America. He graduated from the Respiratory Therapy program at Georgia State University in 1994. In 2007, he was recognized as a Fellow of the American Association for Respiratory Care and in 2017 as Fellow of the American College of Chest Physicians. He is a member of the editorial board for *Respiratory Care,* the *Open Journal of Allergy,* and the *World Journal of Critical Care Medicine*. He is a well-known international speaker with over 60 peer-reviewed publications.

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David W. Chang

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