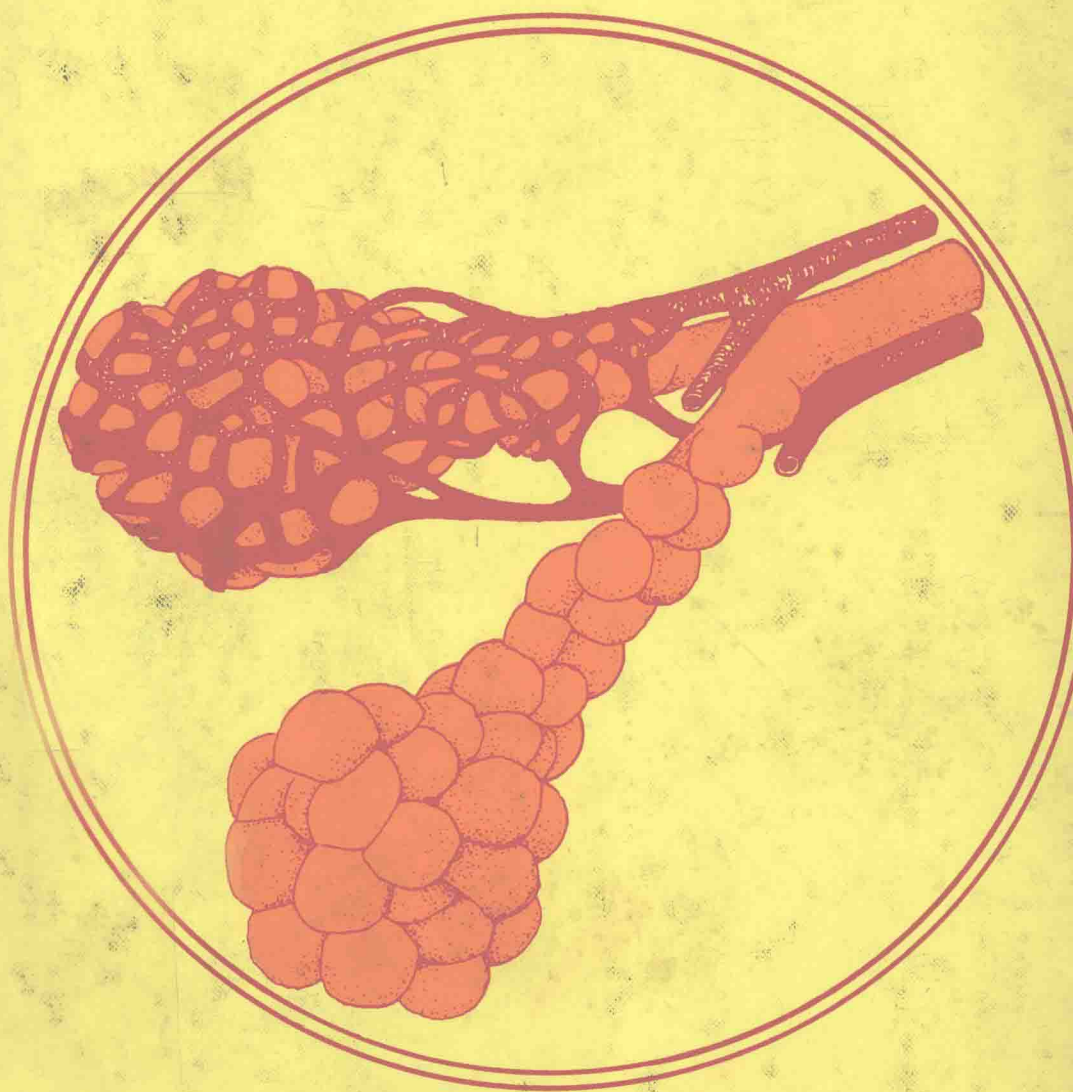


CLINICAL APPLICATION OF RESPIRATORY CARE

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To Bobby, Nancy, and Web

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PREFACE

THE CLINICAL APPLICATION of respiratory care presently exists upon an uncertain and confusing foundation. This is primarily due to the number of medical specialties that have been involved in its development and the direct patient care participation of numerous allied health specialists: respiratory therapists, nurses, physical therapists, and cardiopulmonary technologists.

We believe it imperative that respiratory care be considered a distinct clinical discipline to assure consistently high-quality patient care. We have written this text primarily to present respiratory care in terms of physiologic rationale, clinical indications, and therapeutic goals that may be universally achieved by various methods and techniques.

Chapters 1 through 5 review the scientific fundamentals upon which the discipline of respiratory care must be based. These chapters are intended to be a synopsis for respiratory care practitioners, without pretense of depth or completeness. Chapters 6 through 14 discuss the clinical application of respiratory therapy modalities. The controversy concerning effectiveness and appropriateness of respiratory therapy is placed in perspective while basic physiologic and medical principles are emphasized. Our purpose is to provide a universal and rational foundation upon which applications and conclusions may be based. Chapters 15 through 26 discuss respiratory intensive care and specific clinical concepts. The authors have attempted to demonstrate that evaluation and judgment *can and must* be based upon these sound principles and an orderly approach. The critically ill patient deserves no less!

In essence, this text is intended to be a conceptual and nontechnical discussion of clinical respiratory care for the guidance of all practitioners in this vital field. We hope that such an approach will permit greater communication and respect between those involved in respiratory care—a goal that must inevitably result in improved patient care.

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B. Shapiro
R. Harrison
C. Trout

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CHAPTER 1 • PULMONARY ANATOMY AND PHYSIOLOGY

CLINICAL MEDICINE is predicated on the basic sciences of anatomy, pharmacology, physiology, and biochemistry. The following is an overview of the *functional* anatomy and physiology of the pulmonary system. It is not a definitive treatise, but rather a useful and up-to-date presentation of anatomy and function as related to respiratory care.

The pulmonary system is separated into two major portions: the upper and lower airways. The *upper airway* is composed of the nose, nasopharynx, oropharynx, oral cavity, laryngopharynx, and larynx. The *lower airway* is composed of the tracheobronchial tree and the lung parenchyma. The *tracheobronchial tree* is considered to be two distinct portions: the large and small airways.

The Upper Airway

The upper airway is composed of the nose, mouth, and pharynx. The larynx is the transition from the upper to lower airway. We shall consider the larynx to be anatomically the lower airway but to have functions consistent with classification as part of the upper airway. Among other factors, the upper airway: (1) acts as a conducting system for air to enter the lower airway; (2) acts as a protective mechanism to prevent foreign material from entering the pulmonary tree; (3) constitutes a considerable portion (30–50%) of the anatomic deadspace; (4) accounts for approximately 45% of airway resistance in the process of ventilation; (5) acts as an “air conditioner” of inspired gases; and (6) plays an important role in the processes of speech and smell.

The Nose

The nose is an organ that possesses skeletal rigidity. This rigidity serves to prevent collapse when a subatmospheric pressure is present during spontaneous inspiration. The nose has a small inlet, a large outlet, and is shaped to produce an airflow pattern allowing maximum exposure of inhaled gas molecules with the mucosal surface.

The upper third of the nose is bony; the lower two-thirds is