RESPIRATORY INTENSIVE CARE

Edited by

ROBERT M. ROGERS
M.D., F.A.C.P., F.C.C.P.

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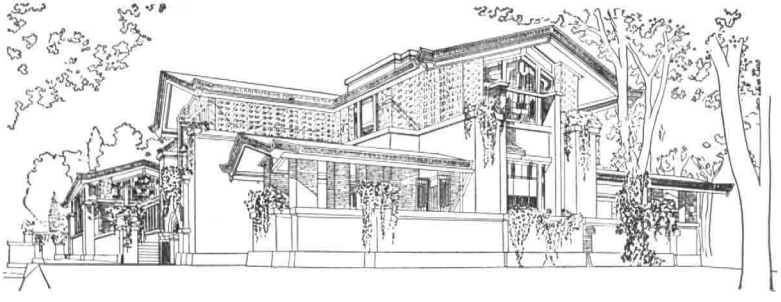

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PREFACE

WHY A BOOK on respiratory intensive care? I have been struggling with this question over the past ten years and this book results from my own personal frustration with available texts to cover specific points for my students. Another reason is the encouragement given to me by a number of former students and participants in our postgraduate education efforts, both at the University of Pennsylvania and at the University of Oklahoma Health Sciences Center.

In trying to cover a topic which presents so many difficulties for the general internist and nonspecialist, one is bound to miss important points. For them I apologize in advance and hope you will point them out to me. My goal is to bring together topics that are of extreme importance in managing a patient in respiratory failure, and to cover the topics in depth. Portions of this symposium have been published in the journal *Chest,* volume 62 (Supplement), 1972. Other articles have been published in *Postgraduate Medicine* and were selected because of the excellent clarity with which the authors present their material. There are five new original contributions which cover areas that were not covered in the previous symposia or which the author felt were not covered adequately in other available sources.

The topics we have chosen are those which have presented the most difficulty to students. The first six articles of the symposium cover important logistical and administrative considerations in establishing and maintaining a respiratory intensive care unit or service. The next two articles cover the very important and difficult topic of acid-base balance which, in my experience, continues to plague many physicians, particularly those trained before measurements of pH and blood gases were readily available to the clinician. The next four articles cover the area of gas exchange in chronic obstructive lung disease, oxygen transport, hypoxemia, hypoxia, oxygen therapy, and other nonventilatory

therapeutic modalities. There is overlap in these articles but I felt that the overlap would help the reader in understanding the very complex problem of gas exchange and oxygen therapy. The next four articles cover mechanical ventilation, beginning with the simplest problems, then discussing a theoretical model to help understand how to adjust the machine in patients who have abnormal lungs, and finally dealing with problems of endotracheal cuffs. Positive end-expiratory pressure is reviewed in a broad sense with most stress on mechanisms so that the reader can easily relate new information in this area to the discussion. We then treat the problems of rehabilitating the chronic obstructive pulmonary patient, a problem often faced by the internist or primary physician. Next follow articles that discuss two very important areas: the use of fiberoptic bronchoscopy and the management of the patient in the postoperative period. This latter review I was extremely pleased to add to the symposium since it offers a rare opportunity for the reader to scan the entire literature on this matter. Finally are included two areas which are taking on some added interest in the therapy of respiratory therapy, particularly the use of artificial lung which is currently being investigated in a multicenter study from which we should gain better insights into how to approach this problem.

It is my hope that the reader will find the contents useful, extending his knowledge and particularly helping him care for the critically ill patient with respiratory failure.

I would like to express my deep appreciation to all of the teachers who have inspired and instructed me over the years, especially to Arthur B. DuBois who has been a friend and mentor, and Robert L. Mayock. Also, I thank the numerous students, housestaff, and pulmonary fellows who have instructed me in so many ways by their probing questions and their knowledge in areas where I was ignorant; and I thank Dr. Alfred Soffer and Mrs. Sylvia Peterson who were such great help with the symposium that I edited in *Chest* and who graciously gave us the articles from that symposium for this book. Finally, I would like to ex-

press my deep gratitude to Miss Jane Henson, our Executive Administrator, and her assistants Miss Sharon Moline, Mrs. Rose Allen and Mrs. Mary Horton who make our lives pleasant and our work possible.

R.M.R.

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RESPIRATORY INTENSIVE CARE

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INTRODUCTION–RECOGNITION OF ACUTE AND CHRONIC RESPIRATORY FAILURE*

ROBERT M. ROGERS AND BARRY A. GRAY

Introduction

RESPIRATORY failure is a common clinical entity encountered on medical, surgical, pediatric, and obstetrical services in all hospitals. Rational therapy can be accomplished only if one recognizes the problem and approaches therapy with an understanding of some physiological principles. It is appropriate, therefore, to introduce this symposium by reviewing some basic physiological concepts required to understand respiratory failure. This chapter will define respiratory failure, outline the diseases most frequently associated with it, and review the clinical signs and symptoms.

Definition

The major function of respiration is to supply the cells of the body with adequate oxygen and to remove carbon dioxide. Respiration includes the following: (1) *ventilation:* the delivery of fresh atmospheric air (inspiration) to the alveoli, where it is exposed to the blood, and removed (expiration) after it has given up oxygen and received carbon dioxide (CO_2); (2) *diffusion:* the movement of oxygen across the alveolar lining and capillary wall into the blood, and the reverse for CO_2; (3) *circulation:* the method of carrying the oxygen to the cells of the body and removing the carbon dioxide from them.

It is evident that hypoxia and hypercarbia can result from inadequate ventilation, or as will be discussed later, hypoxemia alone may result from lung disease due to several mechanisms. Hence, respiratory failure is defined as impaired or inadequate gas exchange, i.e. hypoxemia with or without hypercarbia.

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