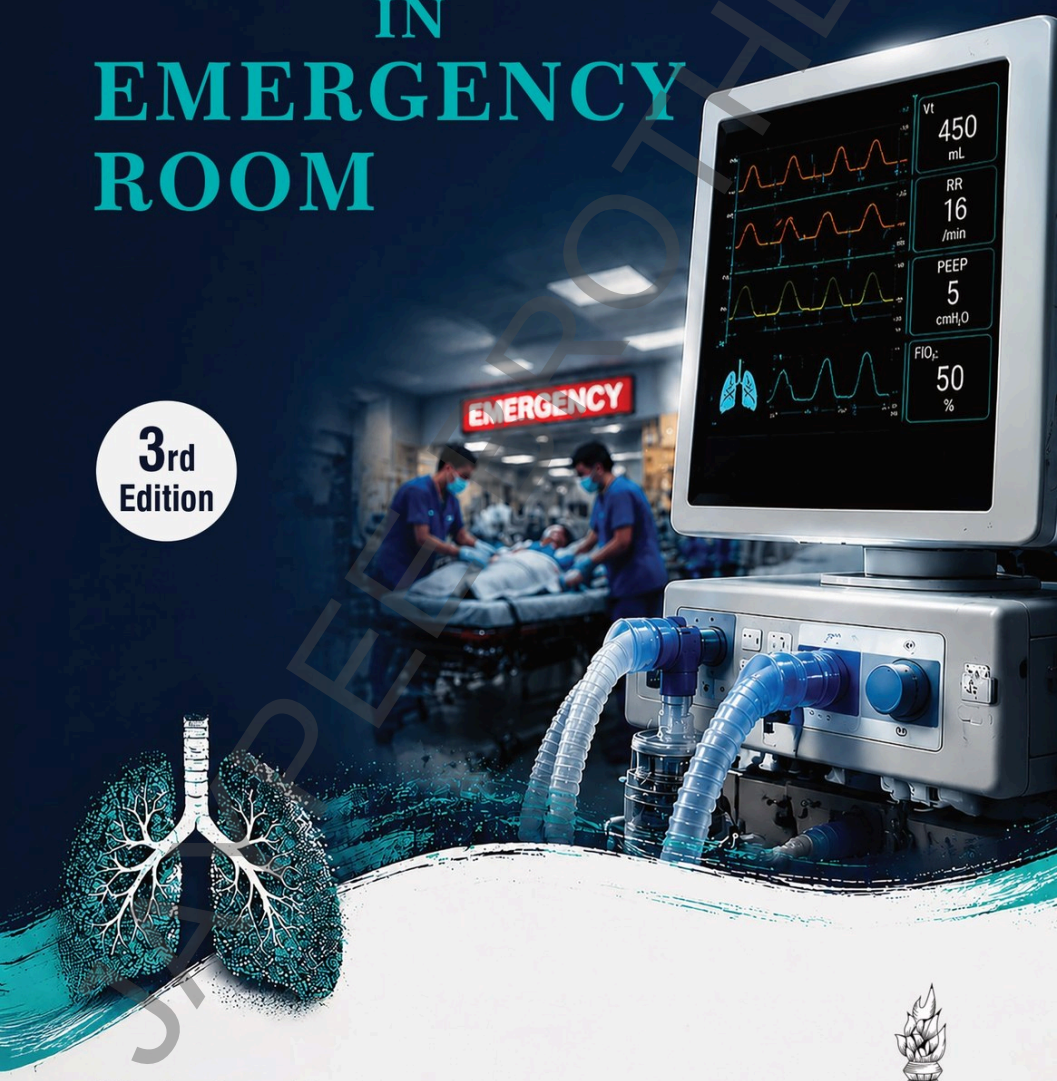
aypee.com, for detailed information on anesthesia books, visit our website www.ejaypee.com, for detailed information on anesthesia books

A GUIDE TO MECHANICAL VENTILATION IN EMERGENCY ROOM



3rd Edition

Kishalay Datta

JAYPEE

JAYPEE BROTHERS

Contents

SECTION 1

BASICS OF RESPIRATION

1. The Act of Breathing 3
- Control of Breathing *4*
- Neuronal Control of Inspiration and Expiration *9*

2. Pulmonary Gas Exchange 10
- Alveolar Capillary Interface *10*
- Gas Diffusion (as per Fluid Dynamics Principle) *12*
- Difference in Partial Pressures of Gases (Oxygen and Carbon Dioxide) in Lungs *12*
- Dead Spaces of Lungs and Ventilation/ Perfusion Imbalance *14*
- Ventilation–Perfusion Mismatch *15*

3. Respiratory Physiology 20
- Lung Volumes and Capacities *20*
- Pulmonary Dynamics *23*
- Compliance *25*
- Time Constants of Lungs *27*

SECTION 2

MECHANICAL VENTILATION

4. Mechanical Ventilators 31

5. Initiation of Mechanical Ventilation 33

6. Drugs Used for Mechanical Ventilation 35
- Ideal Sedation Agent *35*
- Mode of Administration *36*

JAYPEE BROTHERS

- Drugs Used During Mechanical Ventilation *37*
- Rapid Sequence Intubation *37*
- SOAPME *37*
- Induction Agents *38*
- Paralytic Agents *39*

7. Airway Management: The Essentials.....40
- Airway Assessment *40*
- Rapid Sequence Intubation *42*
- Placement of Endotracheal Tube Confirmation *43*
- Approach for Difficult Endotracheal Intubation *44*
- Endotracheal Tube *44*
- Laryngeal Mask Airway (Tube) *44*
- Tracheostomy Tube *44*
- Laryngoscope *55*
- Oxygen Delivery Devices *58*
- High-flow Nasal Cannula *61*

8. Ventilatory Modes 64
- Classification *65*

9. Noninvasive Ventilation 76
- Noninvasive Ventilation *76*
- Weaning *82*
- Complications of Noninvasive Ventilation *83*

10. Inspiratory Pressures and Flow Profiles.....87
- Inspiratory Pressures *87*
- Flow Profiles *88*

11. Pressure-controlled Ventilation 91
- Pressure-controlled Ventilation *92*

12. Positive End-expiratory Pressure 98
- Auto-positive End-expiratory Pressure *99*

13. General Settings in a Ventilator.....102
- Tidal Volume *102*
- Respiratory Rate *102*
- Minute Ventilation *103*

JAYPEE BROTHERS

- Fraction of Inspired Oxygen *103*
- Positive End-expiratory Pressure *103*
- Inspiration–Expiration Time Ratio *103*
- Flow Rate *104*
- Slope *104*
- Trigger Sensitivity *104*
- Inspiratory Peak/Plateau Pressure *105*
- Settings of Ventilator as per Mode Selection *105*
- Ventilator Settings for Better Oxygenation *106*

14. Monitoring of Ventilated Patients 107
- Waveform Capnography *108*
- Ventilator Alarms *112*
- Troubleshooting in a Ventilator *113*

15. Ventilatory Complications in Emergency Room 114
- Ventilatory Complications *114*

16. Ventilator-induced Lung Injury and Ventilator-associated Pneumonia 116
- Ventilator-induced Lung Injury *116*
- Ventilator-associated Pneumonia *116*
- Prevention of Ventilator-associated Pneumonia *118*

17. Weaning Parameters 121
- Prerequisites for Weaning *122*

18. Ventilatory Strategies.....123
- Chronic Obstructive Lung Disease/Asthma *123*
- Flail Chest *124*
- Head Injury *124*
- Neuromuscular Diseases (Guillain–Barré Syndrome/ Myasthenia Gravis/Amyotrophic Lateral Sclerosis/Myasthenia Gravis/Poliomyelitis) *125*
- Myocardial Infarction/Heart Failures/ Hypovolemic Shock *125*
- Acute Respiratory Distress Syndrome *126*
- Recruitment Steps *127*

JAYPEE BROTHERS

19. Ventilatory Graphics.....130

- Scalar Graphics *131*
- Volume versus Time Curve *135*
- Pressure versus Time Curve *137*
- Loop Graphics *141*

Index.....153

JAYPEE BROTHERS

CHAPTER 5

Initiation of Mechanical Ventilation

INTRODUCTION

Mechanical ventilatory support is generally indicated in critically ill patients, whose respiratory effort is not sufficient to maintain their life.

Classically, indications for initiation of mechanical ventilation in such patients can be subdivided under three major heads:

1. *Hypoxia:* It is insufficient delivery of oxygen to tissues. It is arbitrarily defined as partial pressure of arterial oxygen (PaO_2) <60 mm Hg.
2. *High work of breathing (WOB):* Increased work of respiratory muscles can increase WOB, which may result in hemodynamic compromise of the patient.
3. *Hypoventilation:* A rising partial pressure of arterial carbon dioxide ($PaCO_2$) occurs due to hypoventilation.

Also, mechanical ventilation after intubation can be initiated under the following situations:

- Airway protection or securing the airway in a sick patient
- Depressed sensorium (Glasgow Coma Score <8)
- Sudden hemodynamic compromise occurring in a patient
- Sudden cardiorespiratory arrest
- Injury to airways, chest, and facial region causing difficulty in breathing
- *Special situations:*
  - Heavy sedation for procedures
  - Transportation
- *Respiratory muscle dysfunction:*
  - Respiratory muscle fatigue
  - Neuromuscular disease
  - Increased airway resistance
- Failure of noninvasive ventilation (NIV) in patients.

JAYPEE BROTHERS

Based on *pulmonary mechanics criteria*, mechanical ventilation can also be initiated when:

- Forced expiratory volume over 1 second (FEV1) <10 mL/kg body weight
- Forced vital capacity (FVC) <15 mL/kg body weight (can be assessed by spirometer)
- Respiratory rate >35 breaths/min
- $PaCO_2$ >60 mm Hg (if rising and in presence of acidemia)
- PaO_2 <60 mm Hg [on 40% O_2 and widened (A-a) O_2 gradient].

It must always be remembered that all these indications/criteria mentioned for initiation of ventilation above serve as a guide only.

The treating doctor/caregiver has to take all clinical situations under consideration, before going ahead with intubation and initiation of mechanical ventilation.

Alternatively, the patient may not satisfy every criterion for invasive ventilatory management and yet has to be intubated and ventilated.

Considering all of the abovementioned parameters, it should be kept in mind, as an emergency physician, the primary indication is to intubate early, when the doctor at the best of his judgment thinks, it is necessary to intubate and ventilate the patient.

JAYPEE BROTHERS

for detailed information on anesthesia books, visit our website www.ejaypee.com, for detailed information on anesthesia books, visit our web

A GUIDE TO MECHANICAL VENTILATION IN EMERGENCY ROOM

Salient Features

- Contains clear guidelines for the management of ventilated patients
- Offers new chapters on airway assessment and management
- Provides information on drugs to be used for intubation and ventilation
- Presents newer ways of implementing ventilation in emergency situations
- Includes several comprehensive color illustrations to aid learning
- Separate sections detailing the anatomy and physiology of respiration
- Up-to-date and practical guidelines for the management of critically ill ventilated patients
- Extensive use of current literature and guidelines
- Essential references to support all medical professionals, nurses, and technicians working in emergency rooms and intensive care units (ICUs)
- Enhanced images in the chapters on ventilator graphics for easier understanding.

Kishalay Datta MBBS MD MRCP FRCP MHA is Senior Director and Head, Department of Emergency Medicine, Max Super Speciality Hospital, Shalimar Bagh, New Delhi, India. He has worked as an intensivist as well as an emergency physician. He has worked in various emergency departments of hospitals in Australia, Saudi Arabia, the UAE, and the United States. He has coauthored several chapters in emergency medical texts in India and has numerous national and international publications to his credit. He is an examiner for the FRCEM (UK) and NBE-EM examinations. He has been a successful postgraduate teacher of emergency medicine at both the national and international levels. He is also the National Editor of the Indian Journal of Emergency Medicine.

JAYPEE BROTHERS

Buy from ejaypee

JAYPEE BROTHERS

Shelving Recommendation
ANESTHESIA

ISBN 978-81-6799-541-4