ebrothers.com, for detailed information on pulmonology books, visit our website www.jaypeebrothers.com, for detailed information on pulmonology books

NAVIGATING PULMONARY CRISIS

A Comprehensive Guide



Mohankumar Thekkinkattil

Forewords
SK Sharma
Jeffrey Bowden

JAYPEE

Contents

1. **Acute Respiratory Distress Syndrome in the Tropics** 1
   Alladi Mohan, B Venkatarami Reddy, G Bindhu Madhavi

2. **Croup** 10
   Surinder K Jindal

3. **The Vital Role of Biomarkers in Respiratory Emergencies** 16
   Mohankumar Thekkinkattil, Senthil

4. **Acute Severe Asthma** 25
   P Vivek

5. **Pulmonary Renal Syndrome: The Interdependence of Lung and Kidney in Various Disease States** 31
   Cherin Josi Champannoor, Georgi Abraham, Milly Mathew, Divya Sundar

6. **Sleep Apnea-related Emergencies** 46
   HB Chandrashekar, Deepthi Sharma

7. **Chemical, Biological, Radiological, Nuclear, and Explosive Disaster Threat to the Lungs** 53
   Vishnu Sharma M, Anupama N

8. **Pulmonary Embolism** 60
   Jayaprakash B

9. **Management of Massive Hemoptysis** 69
   Venugopal P

10. **Role of Interventional Pulmonology in Respiratory Emergencies** 75
    Harikishan Gonuguntla, Rajeev Viswanathan

11. **Drowning** 82
    Karanam Gowrinath

12. **Emergencies in Invasive Mechanical Ventilation** 87
    Mitul P Chavda, Shailesh Bihari

13. **Respiratory Emergencies in Geriatrics** 95
    K Anupama Murthy

14. Respiratory Complications of Neurological Diseases **102**
Nagachandra Kiran Dharmavaram Harirao

15. Pneumothorax **109**
Siddharth Raj Yadav, Raj Kumar

16. Respiratory Emergencies in Pregnancy **123**
Mahendra Kumar Bainara, Ambika Sharma

17. Re-expansion of Pulmonary Edema **133**
Mohankumar Thekkinkattil

18. Acute Cor Pulmonale **138**
Mohankumar Thekkinkattil, Uthara Vijai Kumar

19. Acute Upper Airway Obstruction **142**
Mohankumar Thekkinkattil

20. Arterial Blood Gas Analysis and Dyselectrolytemia Corrections **150**
Akhil Paul

Index ***161***

CHAPTER

13

Respiratory Emergencies in Geriatrics

K Anupama Murthy

JAYPEE BROTHERS

INTRODUCTION

Globally, the number of elderly over 65 years is projected to increase from 617 million today to over 2 billion by 2050 which will account for 20% of the world's population. Similar to west, India is not far behind. According to the Report of the Technical Group on Population Projections for India and States 2011–2036, there are nearly 138 million elderly persons in India in 2021 (67 million males and 71 million females) which are further expected to increase by around 56 million elderly persons in 2031.

Global Burden of Diseases 2017 estimated a total of 9,909,501 deaths in India. Around 59% of them were estimated to be in elderly population. Mostly attributed to cardiovascular diseases, chronic respiratory diseases, stroke, and cancer among which 16% of cases are due to respiratory failure irrespective of gender.[3] Elderly people at risk for development of respiratory failure have underlying pulmonary diseases [e.g., chronic obstructive pulmonary disease (COPD), bronchial asthma, lung malignancy, and interstitial lung disease], with additional comorbidities such as hypertension, coronary artery disease, diabetes, chronic kidney and liver disease, and immunosuppressed states. Sarcopenia, frailty, and malnutrition can further worsen outcomes in the elderly. Most of admissions in medical and surgical ICU are seen in elderly which may need noninvasive or invasive ventilation. Comprehensive geriatric assessment should be done in elderly not only in medical domain, but also functional, cognitive, and psychological domain with multidisciplinary team effort to improve survival outcomes in elderly and reduce mortality and morbidity.

LUNG AGING

The respiratory system undergoes various anatomical, physiological, and immunological changes with age. Age-related osteoporosis results in reduced height of the thoracic vertebrae. There is stiffening of the thoracic cage from calcification of the rib cage and age-related kyphosis from osteoporosis which reduces the ability of the thoracic cage to expand during inspiration and leads to diaphragmatic fatigue. Due to poor lung compliance, there is high residual volume and increased chest wall stiffness. This leads to poor effort tolerance in patients with preexisting obstructive and restrictive lung diseases. The trachea and large bronchi increase in size by about 10% from youth to old age with increase in

diameter of alveolar ducts and thickening of alveolar sacs. The alveoli become dilated and a progressive concomitant loss of alveolar surface area occurs attributable to intra-alveolar fenestration results in early small airways closure with few air exchange units. Low-grade inflammation or inflammaging can cause proteolytic and oxidant-mediated injury to the lung results in reduced gas exchange across alveolar capillary membrane which can predispose to acute lung injury and acute respiratory distress syndrome (ARDS). Due to inflammaging there is poor reliability on biomarkers in elderly. Immunosenesence reduces host immune response, which makes them more prone to viral and bacterial infections causing pneumonia, sepsis, etc. Aging also induces physiological changes such as reductions in total lung capacity, forced expiratory volume in 1 second (FEV1), and forced expiratory flow, as well as increases in functional residual capacity, and expiratory reserve volume. Maximum voluntary ventilation is reduced with age, with decline in maximal inspiratory pressure which leads to inadequate ventilation and impaired clearance of airway secretions in elderly, this can worsen bronchospasm in patients with underlying asthma and COPD. In addition, other changes include reduced heart rate response, cardiac output, and peripheral muscle mass which may reduce VO_2 max (maximum oxygen consumption) as well cause lung function decline.

SPECIFIC CHALLENGES IN ELDERLY

- Frailty as defined by Campbell and Buchner is a condition or syndrome which results from a multisystem reduction in reserve capacity to the extent that a number of physiological systems are close to, or past, the threshold of symptomatic clinical failure. Early identification of frailty index is important for clinicians in decision making as well advance care planning.
- Functional decline or deconditioning is multifactorial process of physiological changes which results in loss of functional ability that leads to cognitive decline, frequent falls, incontinence, etc.
- In elderly, atypical symptoms are common and poor perception of symptoms leads to early onset of respiratory failure.
- In addition, multimorbidity and comorbidities such as diabetes, chronic kidney and lung disease, malignancy and immunosuppression in elderly need to be considered to prevent polypharmacy and drug–drug interactions.
- Another important challenge is to manage delirium in patients with hypoxia and respiratory failure which can be multifactorial. This can get precipitated by underlying lung disease as seen in COPD patients, bronchogenic carcinoma or during prolonged ICU stay which needs multidisciplinary team approach.
- Cardiopulmonary renal interactions are common in elderly, involve interrelated hemodynamic and neurohormonal mechanisms which are often enhanced due to poor compensatory response in elderly.

COMMON RESPIRATORY EMERGENCIES

Respiratory emergencies in elderly can be due to upper respiratory or lower respiratory causes. We should rule out foreign body obstruction due to artificial dentures, choking on food, spasm of larynx or aspiration which can be aggravated due to underlying neuromuscular problems secondary to poor reflexes, malnutrition, and frailty. Lower respiratory tract emergencies can present with acute respiratory failure with dyspnea, confusion, delirium, and chest discomfort. Acute exacerbations of chronic obstructive

JAYPEE BROTHERS

pulmonary disease, acute exacerbations of chronic respiratory diseases, community-acquired pneumonia, pulmonary embolism (PE), ARDS secondary to sepsis, and cardiogenic pulmonary edema (CPE) are common respiratory emergencies seen in elderly.

Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease is associated with high morbidity and mortality rates and is the third leading cause of respiratory failure in elderly patients. COPD exacerbations present commonly with type 2 respiratory failure with hypercapnia and hypoxia. Elderly may have exacerbation due to viral or bacterial infection or poor symptom control of underlying COPD or flare up of associated comorbidities. Common symptoms are cough, increased shortness of breath, fatigue, drowsy, and anorexia. Clinically, it is difficult to differentiate between acute asthma exacerbation, flare up of acute CPE, acute coronary event, etc. Complications such as pneumothorax, PE, pneumonia or worsening of right heart failure should be considered. Exacerbations in COPD are due to increased flow resistance secondary to secretions and/or bronchospasm, resulting in incomplete expiration. Inspiration before complete expiration leads to dynamic hyperinflation and subsequent reduction in diaphragm strength and respiratory muscle fatigue. Due to reduced respiratory reserve these changes are more frequent in elderly. With worsening hypoxia and hypercapnia, work of breathing increases with prolonged expiratory flow resulting in respiratory failure.

Chronic obstructive pulmonary disease has systemic involvement associated with sarcopenia, malnutrition, insulin resistance, anxiety, and depression which cause elderly prone to infections and worsen respiratory failure. Pharmacologic treatment of COPD in the elderly is based on the guidelines of the Global Initiative for Lung Disease (GOLD). An anticholinergic bronchodilator and a long-acting β-agonist must be used regularly, as most of them have irreversible bronchodilator reversibility. Anticholinergics can worsen pre-existing glaucoma or cause urinary retention, dryness of mouth, etc. Use of cardioselective β-blockers reduces the risk of COPD exacerbations in patients with concomitant cardiovascular disease. It is needed to closely monitor for atrial fibrillation and ventricular arrhythmias in elderly. In addition, during the acute phase, intravenous corticosteroids should be given to shorten this period, after which inhaled corticosteroids may be introduced. Dosage adjustment is needed in patients associated with other comorbidities. In patients with chronic obstructive airway diseases and chronic type II respiratory failure who have lost their hypercapnic drive and rely on hypoxic drive to stimulate ventilation, FiO_2 should be limited to 24–28% by using a Venturi-type fixed performance oxygen mask whenever possible. Noninvasive ventilation (NIV) in COPD exacerbation helps to improve alveolar ventilation, reduces work of breathing, and avoids need of endotracheal intubation. COPD patients are difficult to wean from the invasive ventilation and have more chances to have extubation failure and reintubation. It is difficult to differentiate COPD exacerbation from that of bronchial asthma. Late onset asthma phenotype with fixed airflow obstruction is common in elderly, with predominant small airway disease, makes it difficult to differentiate from COPD or chronic bronchitis. They present often with respiratory failure due to poor perception of hypoxia. Management is on similar lines as COPD except for use of anticholinergics with few exception.

Pneumonia

Many older patients with pneumonia present with a cough (often nonproductive), delirium, anorexia, falls and dizziness, or may present

JAYPEE BROTHERS

with signs of severe sepsis and can have significant in-hospital mortality. Pneumonia severity index (PSI) and CURB-65 (confusion, uremia, respiratory rate, blood pressure-65) score are useful scoring tools to determine mortality and morbidity as well determine need of hospitalization and ICU care. Use of biologic markers such as C-reactive protein (CRP) and procalcitonin may be useful in identifying bacterial infection and guiding antibiotic therapy though they may not be precise in elderly due to poor host response and inflammaging. Several features related to microbiology patterns among elderly patients differ from those of adults with pneumonia, including higher rates of pneumococcal pneumonia and influenza viruses and lower rates of atypical pathogens. Nosocomial pneumonia is common in elderly admitted for other reasons due to poor host immunity. Thus, although each case is different, for outpatients or those hospitalized outside the ICU, a respiratory fluoroquinolone alone or a β-lactam combined with a macrolide generally is indicated which determines prognosis. Dosage of antibiotics needs to be adjusted based on comorbidities and to avoid drug interactions. Oxygen should be provided to keep arterial oxygen saturation (SaO_2) > 92% and fluid balance optimized. Mobility should be encouraged, venous thromboembolism prophylaxis commenced, and oral intake encouraged as long as the aspiration risk is minimized.

Pulmonary Embolism

Pulmonary embolism is the cause of acute RF in 18% of patients with this disease, but it is difficult to recognize and often is overlooked because of its generally nonspecific and atypical presentation. The incidence of venous thromboembolism in older patients is >1% per year which can simulate many cardiopulmonary diseases in this population. Malignancy, postoperative states, and immobility are risk factors that predispose to acute PE. The signs and symptoms of PE are not specific to the diagnosis. Older patients with confirmed PE are less likely to have pleuritic chest pain and more likely to present with syncope than younger patients.[17] Revised Geneva scoring and pulmonary embolism rule-out criteria (PERC) scoring help to stratify probability of PE. Age-adjusted D-dimer cutoffs have been validated for use in low-risk patients >50 years old (revised Geneva Score of "Not high" or Wells Score of "Low") and are beginning to be incorporated into clinical decision tools. Regarding PE, thoracic CT is considered a first-line investigation and is useful in determining alternate diagnoses, such as pneumonia or congestive heart failure (CHF) missed on chest radiography. Management of PE in elderly patients generally is the same as that in non-elderly people, because thrombolytic therapy carries no significant additional risk in older people and the indications and contraindications are the same regardless of age. However, one should consider that sensitivity to the anticoagulant effect of a given dose, along with drug interactions and associated comorbidities, can increase with age.

Acute Respiratory Distress Syndrome

This is complex heterogenous syndrome with increased mortality in elderly. Structural, functional changes, altered immune function, poor physiological reserve, inflammaging and immunosenescence impact outcomes in elderly. In addition, comorbidities make elderly prone to develop multiorgan failure. Study done by Agarwal et al., through multivariate regression analysis, has shown that high-baseline SOFA (Sequential Organ Failure Assessment) scores, pulmonary ARDS, and new onset of organ failures are predominant features which affect mortality

JAYPEE BROTHERS

in elderly. Management with lower tidal volumes and conservative fluid strategy has been shown to have positive outcomes. Specific treatment policy to manage elderly with ARDS need to be evolved to improve treatment outcomes. In elderly, post recovery from ARDS, they will have many residual physical and functional issues with cognitive decline which will increase caretaker burden, they need to be addressed properly to improve quality of life.

Cardiogenic Pulmonary Edema

In this condition, there is extravasation of fluid into interstitium and alveoli due to increased pressure in pulmonary arteries. This precipitates respiratory failure due to reduction in lung volume and reduction in respiratory compliance as well as increased airway resistance. As work of breathing increases, reduced cardiac output is not able to meet demand. Acute heart failure (HF) mimics include most of the causes of acute dyspnea, including pneumonia, COPD, and PE, and it is difficult to establish which is the dominant disorder. Atypical signs of CPE (confusion, leg swelling, and wheezing) are observed frequently in elderly patients. Physical findings that support a diagnosis of HF as a cause for acute dyspnea include increased venous pressures, particularly jugular venous distention and symmetric peripheral pitting edema. In patients who have sufficient edema in the bronchioles, wheezing may be heard, which makes it difficult to distinguish pulmonary edema from a COPD exacerbation. Echocardiography is considered a valid instrument for diagnosing CHF, and its use should be encouraged in emergency departments. Moreover, it has been demonstrated that noninvasive tests such as adding natriuretic peptides, namely B-type natriuretic peptide (BNP) and amino-terminal fragment of the precursor protein [N-terminal pro-B-type natriuretic peptide (NT-proBNP)] to clinical evaluation for CHF improves diagnostic accuracy. Treatment of HF is based initially on a symptom-based approach and then tailored therapy based on the precipitants or predisposing factors. NIV helps to reduce preload and after load, improves ventilation–perfusion mismatch, assists respiratory muscles, increases functional residual capacity, and opens under ventilated alveoli, thus decreasing right to left intrapulmonary shunt, and thereby reduces dead space in CPE.

Diastolic heart failure (DHF) is common in elderly people and is associated with high morbidity and mortality. A history of systemic hypertension and left ventricular hypertrophy are almost invariably present. DHF patients also appear to have increased vascular stiffness, accelerated systolic blood pressure response to exercise, neuroendocrine activation, and reduced quality of life. Doppler and myocardial tissue imaging are recommended for diagnosis. Acute exacerbations (pulmonary edema) frequently occur and are associated with severe hypertension, sodium indiscretion, and medication of noncompliance.

KEYPOINTS

- Atypical symptoms and signs in elderly mostly manifest as delirium, fatigue, anorexia seen in clinical conditions such as pneumonia, sepsis, asthma, and COPD exacerbations. Syncope and chest pain may be presentation in PE, and pneumothorax. Aspiration as a cause of pneumonia in elderly is very common due to dysphagia secondary to neuromuscular diseases, diabetes mellitus, and gastroesophageal reflux disease. Bilateral basal crepitations can be due to diastolic failure, basal atelectasis or CPE. Bilateral ronchi can be due to underlying asthma or COPD, or can be clinical sign of as acute coronary event. Poor perception to hypoxia and hypercapnia is commonly

JAYPEE BROTHERS

seen in elderly. High index of suspicion is needed to do relevant investigations as symptoms may not be organ specific.

- Improper adherence and compliance to regular medication for underlying diseases is frequent in elderly due to cognitive decline, visual and hearing deficits, poor socioeconomic status, and functional decline.
- Triggers such as psychosocial issues, anxiety and depression, delirium, and malnutrition can worsen primary condition.
- Due to inflammaging and immunosenesence, biomarkers like CRP and erythrocyte sedimentation rate (ESR) cannot be so reliable in elderly. We need to rely on noninvasive tests rather than invasive tests for elderly considering risk-benefit ratio.
- While managing elderly, we need to consider underlying comorbidities like chronic kidney diseases, chronic liver diseases to modify drug dosage and consider drug-to-drug interactions.
- Respiratory failure sets in early during acute presentation which may trigger acute coronary event or acute kidney injury, thereby treating physician should be aware of cardiopulmonary renal interactions.
- Complications such as acute coronary event, PE, sepsis, pneumothorax, nosocomial infection, atrial fibrillation, ventricular arrhythmias, gastrointestinal (GI) bleed dyselectronemia, delirium, and depression need to be kept in mind while treating elderly as inpatient which can occur superimposed over primary condition of admission.
- Patients with chronic respiratory disease often have multiple comorbidities such as concomitant cardiovascular disease, hypertension, and a decline in renal function. Decision making in regard to ICU stay, need of noninvasive and invasive ventilation, advanced directives, and palliative care need to be discussed with caretakers of elderly at the earliest.

DECISION MAKING

In elderly, admission in ICU results in functional decline with poor quality of life and long recovery period. Therefore, the decision to admit elderly patients to the ICU should be discussed with caretakers based on the presence of chronic disease, prehospital functional status, severity of acute illness, and patient preferences. Advanced care directives in regard to end of lifecare, intubation and ventilator support, and palliative care should be discussed with caretakers at the earliest. In elderly patients, deterioration in health is exacerbated by physiologic aging effects and concomitant multimorbidities. Goal of treatment is to improve quality of life with early mobility. Age need not be criteria to deny mechanical ventilation but one should look at economic impact and quality of life in places with limited access to rehabilitative services. Thereby comprehensive geriatric assessment with use of multidimensional tools to improve assessment and treatment is required to evaluate quality of life and depression, cognition and physical function, and social and nutritional status, as proposed and fully described by Antonelli Incalzi et al. (2009). In COPD patients and other patients with chronic respiratory diseases after an episode of acute respiratory failure, it is important to adhere to a multidisciplinary approach to prevent further exacerbations. Pulmonary rehabilitation (PR) and early mobilization reduce frequency of readmissions and improve quality of life. Deep breathing exercises, directed coughing and huffing, early mobilization, incentive

JAYPEE BROTHERS

spirometry, positive expiratory pressure, and respiratory muscle training devices are techniques to improve mucous clearance and pulmonary ventilation. Most important is to manage respiratory failure in elderly by individually tailored evaluation, treatment, and interventions and to integrate care to prevent injuries, preserve functional status, and prolong a disability-free life.

SUMMARY

Approach to healthcare of the elderly needs a comprehensive strategy with training, increased awareness and skill building to improve survival outcomes in elderly. Early diagnosis and management of respiratory emergencies with optimal control of comorbidities in elderly will improve overall prognosis.

SUGGESTED READINGS

1. Reves JG, Barnett SR, McSwain JR, Rooke GA. The Aging Respiratory System: Strategies to Minimize Postoperative Complications. In: Rooke A, Reves JG, McSwain JR, Barnett SR (Eds). Geriatric Anesthesiology, 3rd edition. Berlin, Germany: Springer International Publishing; 2018, pp. 179-92.
2. Malik C, Khanna S, Jain Y, Jain R. Geriatric population in India: Demography, vulnerabilities, and healthcare challenges. J Fam Med Prim Care. 2021;10:72-6.
3. Cho SJ, Heather W. Stout-Delgado Aging and Lung disease. Annu Rev Physiol. 2020;82:433-59.
4. Sobhani A, Fadayevatan R, Sharifi F, Kamrani AA, Ejtahed HS, Hosseini RS, et al. The conceptual and practical definitions of frailty in older adults: a systematic review. J Diabetes Metab Disord. 2021;20(2):1975-2013.
5. Global Initiative for Chronic Obstructive Lung Disease (GOLD). (2023). Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease: 2024 Report. [online] Available from www.goldcopd.org [Last accessed Sept., 2024].
6. Karimi L, Lahousse L, De Nocker P, Stricker BH, Brusselle GG, Verhamme KMC. Effect of β-blockers on the risk of COPD exacerbations according to indication of use: the Rotterdam Study. ERJ Open Res. 2021;7:00624-2020.
7. Macrea M, Oczkowski S, Rochwerg B, Branson RD, Celli B, Coleman JM 3rd, et al. Long-Term Noninvasive Ventilation in Chronic Stable Hypercapnic Chronic Obstructive Pulmonary Disease. An Official American Thoracic Society Clinical Practice Guideline. Am J Respir Crit Care Med. 2020;202(4):e74-e87.
8. Tyler K, Stevenson D. Respiratory Emergencies in Geriatric Patients Emerg Med Clin N Am. 2016;34:39-49.
9. Jagathkar G. Acute Respiratory Distress Syndrome in the Elderly. Indian J Crit Care Med. 2021;25(6):613-4.
10. Sehgal IS, Agarwal R, Dhooria S, Prasad KT, Muthu V, Aggarwal AN. Etiology and Outcomes of ARDS in the Elderly Population in an Intensive Care Unit in North India. Indian J Crit Care Med. 2021;25(6):648-54.
11. Herbert JA, Valentine MS, Saravanan N, Schneck MB, Pidaparti R, Fowler AA, et al. Conservative fluid management prevents age-associated ventilator induced mortality. Exp Gerontol. 2016;81:101-9.
12. Xiao K, Liu B, Guan W, Yan P, Song L, Wang Y, et al. Prognostic Analysis of Elderly Patients with Multiple Organ Dysfunction Syndrome Undergoing Invasive Mechanical Ventilation. J Healthc Eng. 2020; 2020:6432048.
13. Incalzi RA, Scarlata S, Pennazza G, Santonico M, Pedone C. Chronic Obstructive Pulmonary Disease in the elderly. Eur J Intern Med. 2014;25(4):320-8.
14. Arnold MT, Dolezal BA, Cooper CB. Pulmonary Rehabilitation for Chronic Obstructive Pulmonary Disease: Highly Effective but Often Overlooked. Tuberc Respir Dis (Seoul). 2020;83(4):257-67.
15. Tyler K, Stevenson D. Respiratory Emergencies in Geriatric Patients. Emerg Med Clin North Am. 2016;34(1):39-49.

JAYPEE BROTHERS

for detailed information on pulmonology books, visit our website www.jaypeebrothers.com, for detailed information on pulmonology books, visit our websit

NAVIGATING PULMONARY CRISIS
A Comprehensive Guide

This book provides a comprehensive exploration of critical pulmonary emergencies, offering clinical insights and evidence-based management strategies. Each chapter, authored by leading specialists from India and abroad, addresses the complexities of life-threatening respiratory conditions. It addresses unique issues such as acute respiratory distress syndrome (ARDS) in tropical regions, severe hemoptysis, and pediatric croup. The book explores advanced asthma care, the role of biomarkers, and crisis management during disasters. It covers pulmonary embolism, cutting-edge interventional pulmonology, and the complexities of geriatric care. Additional topics include neurological and renal complications, arterial blood gas (ABG) interpretation, acute airway obstruction, pneumothorax, acute cor pulmonale, drowning, invasive ventilation issues, and respiratory emergencies in pregnancy. This resource is essential for clinicians and trainees seeking in-depth knowledge of pulmonary crises.



Mohankumar Thekkinkattil MD DPPR is the Head and Senior Cosultant Pulmonologist, Critical Care and Sleep Medicine at OneCare Medical Center, Coimbatore, Tamil Nadu, India. He was President of Indian Chest Society, Indian Association of Bronchology, Academy of Pulmonary Medicine and Critical Care and Coimbatore Respiratory Society. With an illustrious career, he has served as the Head of the Department (HOD) at Sri Ramakrishna Hospital and Kovai Medical Center and was an Assistant Surgeon in Kerala Government service. Dr ThekkinKattil has also been an Assistant Professor and Researcher at Nancy University, France. He is now President of NCCP(I) and was involved in several prestigious organizations and has been involved in numerous roles including past Chairman and Secretary for ERS Clinical Problems, and past Governor for ACCP, AARC, and ISDA. His extensive contributions include 101 published papers, 10 orations, and 10 lifetime achievement awards. Dr ThekkinKattil is a visiting professor in multiple countries and is on the editorial boards of seven journals. He is also the Organizing Chairman for NAPCON 2024, Coimbatore.

Printed in India

Available at all medical bookstores or buy online at www.ejaypee.com

JAYPEE BROTHERS
Medical Publishers (P) Ltd.
EMCA House, 23/23-B, Ansari Road,
Daryaganj, New Delhi - 110 002, INDIA
www.jaypeebrothers.com

Join us on facebook.com/JaypeeMedicalPublishers
Follow us on instagram.com/JaypeeMedicalPublishers

Shelving Recommendation
PULMONOLOGY

ISBN 978-93-5696-804-2