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Managing Chronic Respiratory Diseases: A Respiratory Therapist's Perspective

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Abstract:
Chronic respiratory diseases (CRDs) significantly impact global health, contributing to morbidity and mortality. These complex conditions, including COPD, asthma, interstitial lung disease, and pulmonary hypertension, require interdisciplinary care approaches. Respiratory therapists play a vital role in prevention, management, rehabilitation, and patient education. Effective strategies involve pharmacological and non-pharmacological interventions, patient self-management, and innovations such as telehealth. Overcoming barriers, improving access to care, and adopting emerging technologies are essential to optimizing outcomes and enhancing quality of life.

Keywords: CRDs, COPD, Asthma, Pulmonary Hypertension, Management, Rehabilitation, Education, Innovations.

1. Introduction to Chronic Respiratory Diseases

Chronic respiratory diseases (CRDs) are disorders of the airways and other lung structures. These include chronic obstructive pulmonary disease (COPD), lung cancer, asthma, bronchiectasis, interstitial lung diseases, occupational lung diseases, and pulmonary hypertension (Sandra Gould et al., 2023). CRDs are leading causes of death and disability worldwide. Lung diseases interact with environmental factors such as climate change, smoking, and vaping and are associated with multimorbidity. As diseases of the lung are complex, interdisciplinary approaches are necessary to understand underlying biological mechanisms and identify novel therapeutic options (Ambrosino et al., 2015). Respiratory therapists are allied health professionals with training to assist in preventing the onset and progression of CRDs, maintaining optimum lung function in patients with altered mechanics, and providing education to patients and caregivers in clinical and community settings. These professionals work with physicians and other healthcare providers to assist with assessment, management, rehabilitation, and palliation (Goodridge & Peters, 2019). The following definitions, anatomical and physiological framework, and descriptions of the most commonly encountered respiratory disorders offer essential background for those unfamiliar with the subject and establishes a platform for more thorough discussions.

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2. Understanding Respiratory Anatomy and Physiology

The respiratory system supplies oxygen to and eliminates carbon dioxide from the body (Schweickart, 2017). Oxygen is essential because it is required for glucose metabolism, which provides the energy for muscle movement, brain function, and other processes of the cell. The respiratory system also regulates the pH of blood through carbon dioxide removal and works with the kidneys to maintain acid-base balance.

The anatomy of the respiratory system (Ambrosino et al., 2015) can be divided into the upper and lower respiratory tracts. The upper tract consists of the nose, nasal cavity, mouth, pharynx, larynx, and tonsils. It provides conditions that warm and humidify the air to prepare it for the delicate structures of the lower respiratory tract. The larynx protects the airway during swallowing and assists with production of voice.

The lower respiratory tract consists of the trachea, bronchi, bronchioles, lungs, and alveoli. Air from the pharynx enters the trachea, which splits into two bronchi that go into each lung. Bronchi branch into smaller levels of bronchi and eventually into bronchioles. Small tubes called alveolar ducts channel air to clustered alveoli. Lungs contain bronchi, bronchioles, blood vessels, alveoli, nerves, and supportive tissue; the right lung has three lobes, and the left lung has two. The diaphragm is a dome-shaped sheet of skeletal muscle that builds and releases pressure on the thoracic cavity to force threat inspiration and expiration, respectively.

3. Common Chronic Respiratory Diseases

Chronic respiratory diseases are a group of chronic disorders affecting the airways and other structures of the lungs. Such diseases include chronic obstructive pulmonary disease (COPD), lung cancer, asthma, bronchiectasis, interstitial lung diseases, occupational lung diseases, and pulmonary hypertension (Sandra Gould et al., 2023). Certain chronic respiratory diseases such as COPD and asthma have been highlighted as major causes of morbidity and mortality worldwide. Other chronic respiratory diseases, such as interstitial lung diseases, bronchiectasis, and pulmonary hypertension potentially lead to major long-term negative effects on quality of life and premature mortality.

COPD is an umbrella term used for a collection of conditions that affect airflow, including chronic bronchitis, emphysema, and refractory asthma, with cigarette smoking as the primary cause. Common pathophysiological mechanisms include mucociliary dysfunction, airflow limitation associated with small airway disease, and parenchymal destruction (Mortimer et al., 2015). Asthma is a complex, heterogeneous condition with etiology involving multiple genes and environmental factors. It arises from chronic airway inflammation causing recurrent episodes of wheezing, breathlessness, chest tightness, and coughing. Interstitial lung disease is an umbrella term used for multiple diseases characterized by inflammation and fibrosis of the lungs. Occupational and environmental risk factors are involved in many cases.

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Pulmonary hypertension refers to a group of diseases characterized by ventilation–perfusion inequality, hypoxaemia, progressive right ventricular failure, and premature death. These diseases are classified into five groups, with etiologies including idiopathic, heritable, drug-induced, or associated with other conditions such as connective tissue disease, HIV infection, portal hypertension, congenital heart disease, or chronic hypoxic lung disease.

3.1. Chronic Obstructive Pulmonary Disease (COPD)

Chronic obstructive pulmonary disease (COPD) is a common lung disorder characterized by persistent airflow limitation that is not fully reversible. Alongside asthma, it constitutes a major global health burden, ranked by the World Health Organization as the third leading cause of death worldwide. According to the American Lung Association, COPD was responsible for approximately 149,205 deaths in the United States in 2020, with 3.2 million individuals currently living with the disease (A Sonetti et al., 2010).

Airflow obstruction in COPD may result from small airway disease, parenchymal destruction, or a combination of both processes. Smoking is the primary causal factor driving these pathophysiological alterations. The underlying biology involves chronic inflammation and accelerated lung aging that disrupt the normal balance between injury and repair mechanisms within the lungs. Moreover, dysregulation of the pulmonary immune system increases susceptibility to repeated infections, further promoting disease progression.

Patients with COPD typically present with symptoms such as dyspnea, productive cough, and wheezing. The presence of these clinical features, combined with a compatible history of exposure and confirmatory spirometric results demonstrating fixed airflow obstruction, underpin the diagnosis. Management aims to improve symptoms, reduce exacerbation risk, and enhance exercise capacity. A multifaceted approach incorporating smoking cessation, bronchodilator therapy, pulmonary rehabilitation, and vaccination forms the cornerstone of treatment (Ambrosino et al., 2015).

3.2. Asthma

Asthma, an obstructive airway disease, involves airway obstruction, inflammation, and hyper-responsiveness (Nousias, 2022). The narrowing of airways leads to difficulty exhaling, reduced airflow, and oxygen supply. Long-term exposure to asthma triggers can cause permanent structural changes—a process known as airway remodelling. Common triggers include allergies, irritants, respiratory infections, and exercise. Symptoms generally manifest in childhood but can persist or develop at any age (Kapri et al., 2022). Diagnosis combines medical history, physical examination, and specialised investigations such as spirometry. Management focuses on mediating acute attacks in the emergency department and maintaining an outpatient care plan incorporating environmental control, pharmacological treatment, and patient self-management (Schweickart, 2017). Educating patients about their

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condition can enhance access to care and compliance, facilitating long-term control and improved quality of life.

3.3. Interstitial Lung Disease

Interstitial lung disease (ILD) encompasses a diverse group of diffuse parenchymal lung disorders with heterogeneous patterns of inflammation and fibrosis (B. Tolle, 2022). Both ingress and egress of gases can be impeded in ILD patients, with idiopathic pulmonary fibrosis (IPF) identified as the most prevalent diffuse fibrotic lung condition (Mack, 2017). The prognosis associated with IPF ranks as the poorest among the interstitial lung diseases, with a median survival time of only 3 to 5 years (Disayabutr et al., 2015).

The term fibrosing ILD denotes a subgroup presenting with increased fibrosis detected on serial lung imaging, progressive decline in forced vital capacity (FVC), worsening symptoms and quality of life, and increased mortality risk. A subset of patients with non-IPF fibrosing ILDs also manifests a progressive fibrosing phenotype despite anti-inflammatory or immunosuppressive therapy. During hospitalization, physical therapists who encounter such patients must remain cognizant of contraindications to mobilization, including significant worsening exertional hypoxemia, behavioral derangements, or the occurrence of complex cardiac arrhythmias. These clinicians may find it necessary to liaise with attending physicians to establish appropriate parameters for safe mobilization. Particular attention should be directed toward managing patient lines and supplemental oxygen, conducting vigilant vital sign monitoring, and identifying appropriate opportunities for rest. When necessary, coordination with nursing or medical personnel is advisable to ensure patient safety throughout mobilization efforts.

Given the substantial mortality associated with advanced lung fibrosis or acute exacerbation of ILD, it is imperative to consider the prognosis, potential outcomes of mechanical ventilation, and the role of palliative care once the diagnosis is established. In cases of acute respiratory failure, discussions regarding life support measures and mechanical ventilation risks should be undertaken promptly, with palliative care interventions pursued when appropriate. Acute exacerbation of chronic ILD or acute ILD should be contemplated based on clinical, radiological, and histopathologic findings after exclusion of mimicking conditions. Supportive care remains the cornerstone of treatment for these scenarios, while corticosteroids or immunosuppressants may be indicated in certain acute ILD subtypes such as cryptogenic organizing pneumonia and acute eosinophilic pneumonia. Mechanical ventilation is generally reserved for select patients exhibiting reversible disease processes or those considered candidates for urgent lung transplantation.

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3.4. Pulmonary Hypertension

Pulmonary hypertension (PH) complicates the course and worsens the outcome in chronic obstructive pulmonary disease (COPD) and other chronic respiratory diseases, and may justify more active and more specific therapy (Naeije & A Barberà, 2001). Optimising lung disease management is therefore an important ancillary of group 3 PH by mitigating bronchospasm, ventilation/perfusion mismatch, and gas exchange, and by addressing related comorbidities. Long-term oxygen therapy remains the only established treatment of hypoxaemic chronic lung disease and PH (CLD-PH), with COPD the best documented indication; it improves pulmonary haemodynamics and exercise capacity and delays the progress of PH. It is recommended for COPD-PH patients with arterial oxygen tension <60 mmHg or saturation <91%, for a minimal duration of 15 hours daily, and also in high-altitude PH (Krompa & Marino, 2022). Right ventricular dysfunction develops at an earlier stage of the disease and a similarly earlier intervention would be desirable, but no adequately evaluated options are available. Relief of fluid retention and right heart failure with diuretics is a reasonable option, with a careful monitoring of renal function. Digoxin has been proposed as an inotropic agent for the right ventricle with an uncertain benefit and may also be used to control supraventricular arrhythmias. Pulmonary rehabilitation is safe and effective in COPD-PH and other PH groups, and improves exercise capacity, respiratory function and quality of life in these patients. Treatment of severe obstructive sleep apnoea and obesity-hypoventilation syndrome by continuous positive airway pressure or noninvasive ventilation can reverse PH, presumably by correcting hypoxaemia and hypercapnia.

4. Role of the Respiratory Therapist

Respiratory therapists (RTs) are essential members of multidisciplinary care teams dedicated to the evaluation, treatment, education, and care of patients with cardiopulmonary deficits. Their scope of practice requires specialized education and clinical training that ensure proficiency in the assessment and management of individuals experiencing acute and chronic respiratory challenges, including those with established pulmonary disease. RTs collaborate closely with physicians to deliver tailored therapeutic interventions, which they continuously evaluate to promote the most effective management of symptoms and to enhance patient quality of life (Keene et al., 2015).

5. Assessment Techniques in Respiratory Therapy

Respiratory therapy encompasses patient evaluation methods to determine intervention needs. Medical history and physical examination are fundamental in planning treatment, with pulmonary function tests serving as an adjunct. Additional tools include laboratory findings, arterial blood gas analysis, pulse oximetry, chest X-rays, bronchoscopies, and advanced computed tomography (Rehouma et al., 2020).

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Medical history should probe symptoms such as cough, sputum production, shortness of breath, and chest pain, detailing their onset, duration, and progression. Exposure to toxins—carbon monoxide, radon, asbestos, flammable gases, silica—and smoking habits must be assessed, supplemented by a patient's personal or familial history of chronic respiratory disease and any current or previous treatments.

Physical examination involves careful inspection, palpation, and auscultation of the chest. The inspection can reveal asymmetric chest movement, use of accessory muscles, and altered chest configuration. Percussion may demonstrate tympany, hyper-resonance, or dullness of the thorax. Auscultation is paramount; the presence of wheezing, rhonchii, fine or coarse crackles, and the existence or absence of breath sounds convey critical information about airway obstruction and pulmonary ventilation (Vytrisalova et al., 2019).

5.1. Patient History and Physical Examination

Chronic respiratory diseases (CRDs) are respiratory disorders characterized by symptoms and airflow obstruction that persist over an extended period. They are a global health concern because they cause substantial illness and death worldwide (Moreira et al., 2022). As an allied health profession, respiratory therapy supports patients with various chronic respiratory disorders by delivering diagnostic tests, therapeutic techniques, and quality-of-life interventions (Sarkar et al., 2019). The respiratory therapist's many responsibilities include patient assessments, treatments, education, and resource management. Within a multidisciplinary team, he or she serves as an essential team member who offers expert knowledge and practical skills throughout the continuum of care.

The first step in a comprehensive evaluation begins by recording the patient's history. It is important to determine the nature and duration of symptoms, along with any underlying condition that might affect the lungs. The assessment should consider an individual's employment and leisure exposure, previous chest injuries, medical complications, drug use, and shortness of breath. The respiratory history should also include a record of cough, sputum production, wheezing, and chest pain. A physical examination often begins by measuring a person's arterial blood gases, and the patient should then be observed for several minutes before a formal pulmonary evaluation. The examination takes note of posture, speech patterns, and respiration rate, while also observing for signs of distress. Inspection can reveal specific details about the facial expression, lips, nails, colour, and chest wall shape. The therapist palpates the chest during quiet breathing, performs chest expansion tests, and evaluates voice vibrations, along with checking sinus and lower extremities. Percussion of the lungs can be performed to assess the resonance of the thoracic cavity, while auscultation can reveal breath sounds and any adventitious noise. Chest forward bending enables the therapist to observe the respiratory nervous system and localized pain. Various aspects of the

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cardiovascular, abdominal, neurological, musculoskeletal, and limb examinations also offer valuable insights during the initial assessment.

5.2. Pulmonary Function Tests

Pulmonary function tests can be used to assess lung volumes, capacities, flow rates, and gas exchange. Spirometry is the most common method, measuring airflow into and out of the lungs during rest and forced maneuvers. Lung volumes and capacities quantify the size of the lung and amount of air it can hold. Lung flow rates measure the speed and action of the lungs during inspiration and expiration. Arterial blood gases evaluate oxygen and carbon dioxide concentrations, blood pH, and blood carbonic acid levels, providing insight into alveolar gas exchange.

Chest imaging techniques such as chest radiographs, computed tomography, and ventilation/perfusion scans identify and evaluate structural abnormalities and functional disorders in the lungs. Bronchoscopy is helpful for visualizing the airway, detecting mass lesions, and performing tissue sampling when necessary. These testing methods also provide baseline measurements before initiating chronic respiratory disease management.

5.3. Imaging Studies

Imaging studies provide a crucial adjunct to the assessment of chronic respiratory diseases following clinical evaluation and pulmonary function testing (Kołodziej et al., 2017).

Chest radiography remains the most widely available method of confirming or excluding diagnoses and the primary tool for monitoring disease progression. Computed tomography enables evaluation of disease extent and severity, the assessment of extrapulmonary involvement, and biopsy guidance when necessary. Detailed chest radiographic descriptions should be conducted following guidelines such as those established by the Fleischner Society.

6. Management Strategies for Chronic Respiratory Diseases

Management strategies for chronic respiratory diseases encompass pharmacological and non-pharmacological approaches supported by patient education and self-management, which improve health-related quality of life and reduce hospitalization and mortality rates. Established pharmacological agents for COPD and asthma provide symptomatic relief and favorably influence the natural history of lung diseases. Antibiotics, including aminopenicillins with clavulanic acid, macrolides, and tetracyclines, are indicated in specific instances, with coverage for Gram-negative pathogens advised for patients experiencing frequent exacerbations or severe disease; administration should be guided by culture results or colonization history. Short-acting beta2-agonists and anticholinergics are recommended for dyspnea relief, initially on a regular schedule and subsequently as needed, via inhalers or nebulizers. Long-acting beta2-agonists (LABAs) and long-acting muscarinic antagonists

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(LAMAs) should be continued if part of the stable regimen or promptly reinstated following interruption. Glucocorticosteroids, typically prednisone 30–40 mg/day for five days, reduce hospitalization duration and enhance lung function, but require caution in patients with elevated risk factors; re-administration is unnecessary for individuals already receiving treatment for a recent exacerbation. Comprehensive support during exacerbations includes early mobilization, management of comorbidities, and patient education addressing disease comprehension, exacerbation recognition, adherence to pharmacological and non-pharmacological interventions, and preventative measures. Hospitalization accompanied by supplemental oxygen or mechanical ventilation is warranted in cases of respiratory failure, with oxygen therapy targeting arterial oxygen saturation (SpO2) of 88–92%. Such evidence-based strategies constitute the holistic approach that guides healthcare providers in chronic respiratory care (Ambrosino et al., 2015) (Tzanakis et al., 2022).

6.1. Pharmacological Interventions

Pharmacological interventions constitute a mainstay in the management of chronic respiratory diseases. Drug treatments aim to reverse airflow obstruction, reduce exacerbation incidence, mitigate dyspnea, improve overall health status, enhance exercise capability, and improve lung function (Mandru et al., 2021). The Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommends inhaled bronchodilators, corticosteroids, and adjunct therapies, especially when exercise capacity is impaired or breathlessness decreases quality of life. COPD frequently coexists with non-respiratory conditions such as heart failure, coronary artery disease, obstructive sleep apnea, and diabetes mellitus, which must be assessed and managed accordingly. Preventative measures including vaccinations and smoking cessation are beneficial at all stages. For patients on maximal inhaled therapy, a combination of dual bronchodilators plus inhaled corticosteroids reduces mortality of pulmonary or cardiovascular origin. In such cases, macrolides and roflumilast may be appropriate as adjuncts. Procalcitonin guides the need for antibiotics, thereby limiting superfluous use in stable phases or mild exacerbations (Tzanakis et al., 2022). First-line agents include aminopenicillins with clavulanic acid, macrolides, and tetracyclines, with added coverage against Gram-negative pathogens in severe cases. Short-acting beta2-agonists and anticholinergics relieve bronchoconstriction and should be administered regularly during exacerbations depending on severity. Systemic glucocorticosteroids accelerate recovery, shorten hospitalization, and improve lung function; a prednisone dose of 30–40 mg/day for 5 days is standard, and tapering is unnecessary. Supportive care emphasizes early mobilization and management of comorbidities. Hospitalized patients with respiratory failure require supplemental oxygen, targeting arterial oxygen saturation (SpO2) of 88–92%.

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6.2. Non-Pharmacological Approaches

Non-pharmacological treatment approaches include smoking cessation, behavioral modification, promotion of long-term physical activity, pulmonary rehabilitation, domiciliary oxygen, and assisted ventilation (Hatipoğlu & Sami Aboussouan, 2022) (Janssens & M. Verleden, 2023). The respiratory therapist can prescribe and demonstrate inhaled bronchodilators using aerosol delivery devices. Under the supervision of a practitioner, the respiratory therapist can administer pharmacological agents including oxygen therapy, bronchodilators, inhaled and systemic corticosteroids, as well as antibiotics. Appropriate use of long-term oxygen therapy can provide symptomatic relief. Additional non-pharmacological treatments for patients with COPD include ambulatory oxygen, lung volume reduction surgery, lung transplantation, and various palliative approaches. Other treatment strategies include non-invasive ventilation, airway clearance, and unipap or bipap therapy.

6.3. Patient Education and Self-Management

Patient education and self-management constitute vital components of chronic respiratory disease management. Principles of chronic obstructive pulmonary disease (COPD) self-management underpin effective therapy and aim to develop patients' skills and confidence to live well with their condition (Poureslami et al., 2016). Robust evidence also supports self-management interventions in asthma, pulmonary fibrosis, and other chronic respiratory diseases. The adoption of generalized self-management programs is an important part of management for the majority of respiratory patients. Although the provision of effective COPD self-management remains low worldwide, innovative strategies—including digital technology—and engagement with patient organizations hold significant promise for achieving this at scale. Chronic respiratory disorders contribute substantially to the global burden of disease, disability, and death. Almost 30% of all deaths worldwide in 2012—approximately 17.5 million—were due to chronic noncommunicable diseases, and chronic respiratory diseases were among the most important contributors to this burden (Cravo et al., 2022).

7. Innovations in Respiratory Care

Telehealth programs play an increasingly important role in managing chronic respiratory diseases (Ambrosino et al., 2015). Digital technologies provide comprehensive data on health status, treatment use and context-specific information and also present an opportunity for personalised disease management (D. Blakey et al., 2018). Initiatives to deliver mobile-health interventions to enhance self-management and treatment adherence have expanded substantially in recent years. These approaches are yet to become routine in clinical practice despite their potential to improve outcomes and reduce the burden of respiratory illness. Diverse lung diseases continue to impose a substantial burden on public health worldwide.

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Progress in treatment is limited by incomplete understanding of pathogenesis. Because the range of lung diseases is so broad, it is unsurprising that there are many unresolved questions (Chang, 2013).

7.1. Telehealth in Respiratory Therapy

Telehealth, widely implemented during the 2020 coronavirus disease (COVID-19) pandemic, can play an important role in the ongoing management of patients with chronic respiratory diseases (CRDs). These diseases—such as chronic obstructive pulmonary disease (COPD), asthma, interstitial lung disease, and pulmonary hypertension—pose a major burden worldwide. A respiratory therapist—primarily responsible for evaluating, treating, and caring for patients with diseases of the respiratory tract—is a key provider in CRD management. Telehealth is at the forefront of new medical technologies that will continue to innovate the evolving role of the respiratory therapist in this regard (Simeone et al., 2022).

7.2. Emerging Technologies

The prevalence of chronic respiratory diseases is increasing worldwide, driven by population aging and continued exposure to respiratory risk factors. Conventional face-to-face disease management methods are increasingly challenging to maintain. Respiratory therapies benefit from the advances in technology that have yielded numerous possibilities for supporting patients with chronic respiratory diseases, including enhanced self-management support and monitoring through telehealth platforms and the Internet of Things (W Costello et al., 2017) (Honkoop et al., 2022).

8. Challenges in Managing Chronic Respiratory Diseases

Chronic respiratory diseases (CRDs) constitute a major health problem worldwide, with prevalence and mortality rates continuously rising, despite increased awareness and availability of effective therapies. Data show that regular physical activity reduces hospitalization and mortality in COPD. Self-management, including behaviour modification, is the cornerstone of COPD care. Undiagnosed COPD frequently occurs at initial hospital admission for exacerbation. Barriers to adherence to COPD guidelines among primary care providers limit optimal treatment. Barriers negatively impact referral and attendance at pulmonary rehabilitation programmes. Treatment adherence, including correct inhaler use, influences risk of hospital admission and mortality.

COPD is considered a paradigm for the care of chronic respiratory conditions. Education for healthcare staff requires improvement, particularly regarding respiratory pathophysiology and the social aspects of respiratory conditions. An outpatient respiratory specialist able to establish collaborations with primary care could be instrumental in supporting services for prevention, early diagnosis, management of chronicity, and provision of end-of-life care. General practitioners should receive training in first-level diagnostics and management, with

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at least one RP in each Primary Care Unit specialising in respiratory medicine. Respiratory specialists require education concerning second-level interventions, audits of healthcare activities, and compliance with European guidelines. Development of diagnostic and therapeutic pathways calls for increased multidisciplinary collaboration. The NHS should assign a role to organise, fund, and audit networks; support health education initiatives; and provide resources for self-management and disease monitoring. Citizens are responsible for adopting behaviours aligned with prevention and early detection, whereas patients and caregivers require education on self-management and correct inhaler use. Pharmacists should assume a central role in early diagnosis, drug monitoring, adherence promotion, and management of adverse effects. Pharmaceutical industries can aid in the development of more effective, user-friendly, and sustainable drugs, and contribute to education and advocacy activities.

Respiratory Health Professionals (RHPs) with specialty training in asthma and COPD care for patients affected by advanced diseases with a heavy symptom burden, who receive markedly less palliative care than patients with similar disease profiles. These professionals perceive a potentially important role in the delivery of palliative care to advanced respiratory patients. They report several barriers to engaging in discussions regarding palliative care with patients. (Ambrosino et al., 2015)

8.1. Access to Care

Numerous impediments undermine respiratory therapists' ability to deliver effective chronic respiratory disease (CRD) management. Among these, access to care remains a foremost obstacle. The chronic nature of diseases such as the airflow limitations associated with chronic obstructive pulmonary disease (COPD) renders broad telemonitoring strategies impractical (Ambrosino et al., 2015). Yet electronic health applications can provide support to non-complex, stable patients. Such eHealth modalities can also be employed in post-exacerbation phases when a return to previous symptomatic states is anticipated.

Despite the adoption of multiple eHealth strategies, several access-related issues persist—particularly in preliminary and emergency-care settings. A substantial fraction of COPD admissions continue to present without a pre-established diagnosis. Healthcare professionals' attitudes towards technology further impede utilization; a survey of respiratory health professionals (RHPs) revealed that 27% undertook no patient discussions on palliative care, and an additional 28% did not feel comfortable initiating such conversations (Goodridge & Peters, 2019). Such reluctance restricts the dissemination of crucial information to patients who may otherwise have received guidance on symptom management, advance-care planning, and service access. Although adherence to prescribed therapies also limits performance in CRD management, the pathways linking access to care with compliance remain imprecisely defined.

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8.2. Patient Compliance

Patient compliance is a major hurdle in the management of chronic respiratory diseases (CRDs) since inadequate adherence to treatment and difficulties with inhaler techniques are common among patients (George & Bender, 2019). For example, ≈40% of patients with asthma and COPD do not comply with long-term treatments, and only 31% of patients with bronchial asthma consistently use inhalers as prescribed (S. Gaude et al., 2014). Patient acceptance of the disease process and the proposed therapy, knowledge of and confidence in the treatment, effective patient-clinician interaction, and routinization of drug therapy are critical for medication adherence. Focusing on the patient's beliefs about medication, understanding the causes of forgetfulness as a reason for suboptimal compliance, and the use of a multidisciplinary approach that addresses both the mental and physical aspects of the disease can support treatment efforts. Technology also can help with medication reminders, avoidance of triggers, and the early detection of deteriorating symptoms. Communication remains the most effective tool for optimizing drug delivery and adherence to inhalation therapy, and taking special care to tailor the treatment regimen to individual patient needs and abilities can improve compliance (C Lareau & P Yawn, 2010). Advising patients to follow their prescriptions as closely as possible and providing motivational support at every visit are vital for preventing acute attacks and achieving long-term control of CRDs.

8.3. Healthcare System Barriers

Healthcare systems and insurance schemes sometimes create barriers to effective chronic respiratory disease management. Patients with diagnostic and therapeutic needs may prefer self-medication rather than face costs or travel burdens. Without a diagnosis and careful counselling, they may follow less effective or harmful pathways from self-medication to traditional medicine and finally a health-care facility. In one study, patients' initial reactions to symptoms guided decisions to seek a formal diagnosis, and their perceptions of the disruption caused by their symptoms influenced their ongoing motivation to engage with health-care services (Nguyen et al., 2021). Other factors affecting continued progression through a formal health-care pathway are the level of knowledge about their condition and the availability of support from social networks.

In Chile, respiratory therapy services initiated by an intensive care team had positive effects on palliative and end-of-life care. Canadian respiratory care specialists identified challenges in providing palliative care to patients with advanced respiratory disease. Improving communication skills among health professionals can facilitate more effective health education and build patient trust. Individual abilities to navigate the health-care system are shaped by system-accessibility factors, and solutions should address both. Increasing system accessibility, such as community education to enhance health literacy, promotes timely care and reduces reliance on self-medication. Treatment costs can burden patients; although health

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insurance in Vietnam covers 80–100% of costs, 13% of patients remain uninsured, and some medications and services are not included. Updating insurance coverage could improve care.

Of 123 respondents to a Canadian survey, the majority indicated that end-of-life care was less than optimal for patients with advanced respiratory illnesses and agreed that palliative care should be a role of respiratory health professionals (Goodridge & Peters, 2019). Patient- and family-related barriers to having end-of-life discussions included difficulty accepting prognosis, limitations and complications, and lack of capacity. Among physician and provider barriers, the most important were lack of training, uncertainty about prognosis, and lack of time. System barriers of concern were increasing demand for palliative care services, limited accessibility for those with advanced respiratory diseases, and difficulties in accurate prognostication.

9. Future Directions in Respiratory Therapy

The resurgence of the series "This Week in Respiratory Care" has generated positive feedback from respiratory therapists (RTs) worldwide. Respondents have requested coverage of other topics associated with chronic respiratory diseases such as chronic obstructive pulmonary disease (COPD), inhaled corticosteroids, humidification, and future needs in cardiorespiratory management. Respiratory therapists desiring an overview of the discipline may refer to (Zaccagnini et al., 2024).

Strategies to address the chronic management of respiratory conditions require consideration of first-line therapies and the broader needs that must be addressed to meet patient requirements. The anticipation of future directions in chronic respiratory care examines the current body of knowledge alongside the diversity of research and practice questions that RTs consider worth pursuing.

As one branch of allied health, respiratory therapy has advanced in its practice to gain recognition as an important contributor within the multidisciplinary management of many cardiorespiratory disorders. A central theme is the delivery of a program that serves both the patient with a respiratory condition and the system treating the individual. Multiple goals are commonly sought:

• The control of progressive respiratory insufficiency • The reduction of hospital visitation • The restoration of productive employment • An enhanced quality of life that enables participation in valued activities • Ongoing management to contain expenses within available budgets

The workplace demands a tried, tested, and easily implemented portfolio of evidence-based solutions to the challenge of managing chronic respiratory illness effectively and efficiently. Whereas the specialty may not yet have an overall protocol to cover all eventualities, RTs are actively exploring promising leads that show the potential to enhance service delivery.

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9.1. Research and Development

Respiratory therapy research concentrates on developing strategies to improve patient outcomes, optimize clinical practice, enhance the therapeutic relationship, and facilitate the transition of care from hospital to community or care homes—particularly relevant in pediatrics and for chronic ventilation patients. Additional priorities include the integration of emerging technologies, the innovative application of existing technologies, and investigating therapeutic interventions conducted by respiratory therapists (Zaccagnini et al., 2024). Respiratory nurses play a key role in multidisciplinary teams, addressing patient care and management through education, training, counseling, capacity building, symptom management, and pulmonary rehabilitation. Despite their importance, there is limited evidence on their role, cost-effectiveness, and clinical impact (Ann Kelly et al., 2018). NHS policy underscores integrated care, public health, self-care, and service configuration, with an emphasis on managing patients with complex needs and comorbidities. The development and validation of services, alongside measuring the effectiveness of interventions, are increasingly important for an aging population with long-term respiratory conditions. Respiratory nurses are well positioned to lead collaborative research addressing outcomes for patients, carers, and healthcare systems. Identifying research priorities remains essential to addressing gaps; existing frameworks, such as those articulated by the American Thoracic Society, provide direction on health promotion, disease prevention, end-of-life care, and disease-specific areas including lung cancer and cystic fibrosis.

9.2. Interdisciplinary Collaboration

The complexity of chronic airway diseases demands the involvement of multiple health professionals to provide effective care. Respiratory therapists, in collaboration with specialized nurses, general practitioners, and respiratory specialists, form a multidisciplinary team that addresses the diverse needs of patients (M. McDonald et al., 2022). The effectiveness of such patient-centred multidisciplinary care models has been demonstrated by pulmonary rehabilitation programmes and multidisciplinary asthma education clinics, which offer significant benefits including improvements in symptoms and quality of life, and reductions in hospitalisation and emergency visits. Patients with advanced respiratory disease have unmet needs that could be addressed by the integration of palliative care according to current evidence and guidance. Respiratory health professionals are well positioned to provide elements of palliative care that are supportive of chronic disease management and palliative care integration that, through collaboration, training and research, may help address gaps in care, including limited access to specialist palliative care and difficult transitions (Goodridge & Peters, 2019).

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10. Case Studies in Chronic Respiratory Disease Management

Two case studies illustrate typical presentations requiring both acute and chronic management, with an emphasis on disease prevention. Chronic obstructive pulmonary disease (COPD) and asthma are among the most common conditions encountered by respiratory therapists, and early intervention contributes to a reduction in long-term complications.

The first case concerns a 73-year-old male with a 15-year history of chronic bronchitis and emphysema. Chronic mucus secretion maintains the condition, but on this occasion, the symptoms have progressed to an exacerbation after a recent flu-like episode. The patient has a 40 pack-year smoking history and is admitted with increased dyspnea, sputum production, and cough. The clinical presentation includes a prolonged expiratory phase with accessory muscle involvement, fine inspiratory basal crepitations, and peripheral cyanosis in the nail beds. Saturation on room air is 80%, and ABG analysis reveals severe respiratory acidosis.

Management is directed toward the underlying cause of the exacerbation, and confirmation is sought from sputum culture and chest X-ray. Physiotherapy concentrates on airway clearance, breathing control, and relaxation. After initial treatment with bronchodilators, steroids, and antibiotics, the patient is discharged on home oxygen, maintaining SpO2 > 90% (Ambrosino et al., 2015).

The second case is a 5-year-old female child attending third class in a remedial school. There is a strong family history of asthma, and the child has been wheezy since about 2 years of age, with seasonal exacerbations in late spring or early summer. The symptoms are suggestive of asthma, and an exercise test confirms the diagnosis. The child attends a catch-up swimming course with a number of other similar children to encourage exercise and to promote education in a group setting. Management of the school environment, and liaison with school personnel, complements the “at home” treatment.

10.1. Successful Management of COPD

Chronic obstructive pulmonary disease (COPD) remains a major worldwide health concern, and respiratory therapists play a crucial role in its management. COPD is a chronic inflammatory process characterized by partial recovery from episodes of acute airway inflammation and destruction of the lung parenchyma (Cravo et al., 2022). Risk factors include exposure to cigarette smoke, air pollution, and occupational dusts and chemicals. Characteristic airflow limitation results from two primary processes: inflammation in small airways leading to fibrosis and luminal plugs and parenchymal destruction that reduces tethering forces keeping airways open. The respiratory therapist, an allied health professional, collaborates with a multidisciplinary team to optimize cardiopulmonary function and minimize symptoms. Therapists assess physiologic impairment and disseminate evidence-based therapies. For most patients, COPD is a preventable and treatable disease characterized

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by persistent respiratory symptoms and airflow limitation. The primary risk factor remains cigarette smoking; however, other environmental exposures may contribute to the disease. Assessment of cardiopulmonary function allows the respiratory therapist to disseminate protocols that decrease the work of breathing and enhance oxygen delivery. Further management optimizes airway care, maximizes medications, and advises on smoking cessation. Supportive therapies enable patients to improve exercise capacity, reduce infections, and control exacerbations. Effective interventions empower patients and improve outcomes.

10.2. Asthma Management in Pediatric Patients

The prevalence of asthma in children necessitates careful and rigorous management by respiratory therapists who provide advice and monitoring (Mandal & Kaur Sahi, 2017). The Global Initiative for Asthma recommends a stepwise approach, primarily based on symptoms, while spirometric assessment of airway obstruction is essential for evaluating severity and treatment response (V. et al., 2021). Action should be initiated promptly after reviewing the frequency of acute episodes and chronic symptoms. Inhaled corticosteroids are the recommended first choice of pharmacotherapy; a spacer device is advised at all ages (Sciuca et al., 2018). Allergen immunotherapy and alternative anti-inflammatory agents may be considered when appropriate. Non-pharmacological interventions include an adequate diet, managed physical activity and a healthy lifestyle. Therapy usually follows a stepwise approach depending on severity of symptoms, and should be progressively tapered as symptoms abate; the final goal is to achieve a symptom-free, well-controlled period. Children with asthma generally visit healthcare professionals every one to six months for symptom and treatment-response assessment. When control has been maintained for at least three months, medication doses can often be reduced; if control is inadequate, the treatment plan, delivery technique and avoidance of triggers require systematic review. Despite clear evidence-based guidelines, problems persist in managing children with asthma. The overall aims of therapy are to achieve good symptom control alongside maintenance of normal activity, lung function and quality of life. In severe asthma, the first imperative is a review of the initial diagnosis. Children with “difficult-to-treat” or “problematic” asthma may present with wrong diagnoses, untreated comorbidities or adverse environmental factors. Normal adherence to treatment remains a major obstacle, especially in adolescents. The key priorities for a respiratory therapist are therefore rigorous monitoring that achieves good adherence to therapy, alongside appropriate education, support and reassurance.

11. Ethical Considerations in Respiratory Therapy

Complexities frequently arise because chronic respiratory diseases not only lead to high levels of disability but also seriously jeopardize patients’ dignity. Often, patients reach the point of needing ventilatory assistance. Determining the extent of care to administer presents

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multiple challenges. For example, while a patient cannot be compelled immediately to undergo treatment, acute presentations such as exacerbations provoke questions about the physician's obligation to provide assisted ventilation, especially if the patient resists. Since the condition is chronic and incurable, ongoing debates focus on the proportionality of care to be supplied to maintain acceptable functioning or health-related quality of life. These considerations affect interventions from the use of home oxygen therapy to, in extreme cases, tracheotomy. The psychological and social impacts of escalating dependence must also be considered when deciding on care modalities (Goodridge & Peters, 2019). From the outset, the professional, fully dedicated to the patient's welfare, must respect the therapeutic contract established between the doctor and the patient. Regardless of the illness's severity, it is essential to maintain the capacity to communicate with the patient. The caregiver's commitment relies on the concepts of fidelity to commitments, confidentiality, and the good faith of the therapeutic contract—whether explicit or implicit—that binds the patient and the care team (S DuCasse, 2013).

12. Patient-Centered Care in Respiratory Therapy

Chronic respiratory diseases (CRDs) are prevalent worldwide and contribute to considerable disability and premature death. Their impact is increasing due to continued exposure to risk factors and ageing populations. Respiratory therapists (RTs) are extensively involved in the management of CRDs through clinical care, research, healthcare system design, and education. Patient-centred care is fundamental to the role of the RT, and approaches that focus on individual patients or patient groups rather than on topics or professional disciplines are needed to develop evidence-based patient-centred respiratory therapy.

Chronic respiratory diseases include chronic obstructive pulmonary disease, asthma, interstitial lung disease, and pulmonary hypertension. They are characterised by airflow obstruction and a broad range of signs and symptoms caused by multiple pathophysiologic mechanisms that frequently co-exist. Understanding the source and cause of these signs and symptoms empowers the RT to appreciate disease severity and evaluate the effects of therapeutic interventions.

The respiratory system consists of the conducting airways and the gas-exchange units with their blood supply. Conduction of air occurs through the trachea, the right and left mainstem bronchi, the lobar and segmental bronchi, and the terminal bronchioles. Gas exchange occurs across the walls of the alveolar ducts and alveoli that derive from respiratory bronchioles. Pulmonary circulation carries blood from the right heart through the alveolar capillary network to the left heart. The chest wall consists of the ribs, intercostal muscles, and diaphragm, which protect the lung and aid ventilation (Goodridge & Peters, 2019).

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The RT works within a multidisciplinary team with expert knowledge of the assessment and management of patients with respiratory disease, to determine the appropriate treatment, and to evaluate the effectiveness of therapeutic interventions. Care delivery is constantly evolving to improve treatment options and access to care and to ensure that the patient and family have a clear understanding of the disease and the best means to manage it. Techniques are necessary to identify the nature of the problem and to determine whether or not the intervention has been effective. Chronic respiratory diseases present a number of challenges to patients and the healthcare providers involved in their care that need to be overcome.

The RT is involved in the assessment of patients with a respiratory problem, through a history, a physical examination, and a comprehensive cardiopulmonary assessment. This may include cardiopulmonary auscultation, measuring vital signs, and making observations of the patient. Investigations that the RT may conduct include pulmonary function testing (spirometry, lung volumes, diffusing capacity}, arterial blood gases, pulse oximetry, radiology, and CT scans. Analysis of the clinical data is required along with an understanding of normal values.

13. Cultural Competence in Respiratory Care

Chronic respiratory diseases (CRDs) constitute a substantial public health challenge worldwide. Chronic obstructive pulmonary disease (COPD), asthma, interstitial lung disease, and pulmonary hypertension are among the leading contributors. In many cases, respiratory therapists participate as part of a team of specialists. Cultural competence, which occurs when a caregiver has the patient's health beliefs and practices in mind, is especially important to connecting with patients when cultural backgrounds differ. The respiratory therapy profession began in the 1940s as on-the-job training for oxygen technicians but has since evolved into a profession requiring formal education. The strategic plan of the American Association for Respiratory Care (AARC) emphasizes cultural competency as a vital skill for new respiratory therapists (Alshehri, 2015).

14. The Impact of Air Quality on Respiratory Health

The quality of air encountered daily informs pulmonary health. Indoor pollutants often cause respiratory irritation and related health problems. Poor air also increases the sensitivity of the airways and the incidence of respiratory symptoms. Individuals with pre-existing lung or heart disease are especially at risk for adverse health outcomes. Several studies have shown a relationship between exposure to outdoor air pollution and adverse health effects, and that people with specific chronic diseases appear to be particularly vulnerable. By the 2030s, at least 6.6 million premature deaths each year will occur attributable to outdoor air pollution. Several interventions have been proposed, but outdoor air pollution continues to be a worldwide problem. Indoor air pollution also remains a primary contributor to the burden of

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exacerbations of illness and death. Enhanced monitoring and evidence-based interventions must therefore be developed and implemented to increase the overall air quality at the individual and community level (Souto-Miranda et al., 2020) (Spurr et al., 2014).

15. Conclusion

Chronic respiratory diseases (CRDs), including asthma, chronic obstructive pulmonary disease (COPD), interstitial lung disease, and pulmonary hypertension, considerably contribute to morbidity and mortality globally. Respiratory therapists provide indispensable care throughout the spectrum of chronic respiratory diseases, collaborating with other healthcare professionals to minimize the burden of disease (Nardini et al., 2017). Comprehensive assessment involving respiratory history, physical examination, pulmonary function testing, and chest imaging enables the development of targeted management strategies. Therapists implement pharmacologic and nonpharmacologic interventions, emphasizing patient education and promotion of effective self-management to optimize health outcomes. By incorporating advances such as telehealth and novel therapies, respiratory therapists continue to enhance disease control and enhance access, ultimately improving symptom management and quality of life in this patient population.

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