

EXPLORING THE PERSPECTIVES OF HEALTHCARE PROFESSIONALS(HCPs)  
ON “PULMONARY REHABILITATION” FOR PERSONS WITH  
CHRONIC RESPIRATORY DISEASES(CRD) –  
A CROSS-SECTIONAL STUDY

by

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## **Dedication**

माता पिता गुरु दैवम्!

to my mother, my father, my teachers, and the Divine!

## **Acknowledgements**

This is not a mere collection of data and chapters; it's my rewarding journey over couple of decades, ignited by the magical power of Rehabilitation Medicine which powered my passion to engage in research and alleviate human suffering.

I bow down to my mother Prof.T.K.Valsamma and my father Late M.Sivapalan whose academic legendary paths I followed.

I am so grateful to my guide and guru Dr.Atul Pati Tripathi sir and SSBM scholars who have been my guiding stars in this transformative journey. My guru Deepak Agarkhed sir, Dr.Maheswarappa Sir, Dr.Sachin Kumar sir and all my teachers who always trusted in my skills and passion to make a difference in the society.

My sister Saritha.V.S, brother-in-law Bobby S Kumar and my nephew Arunabh whose pride in my achievements pushes me to dream bigger. My senior Dr.Elizabeth Johnsen and my friend Avinash for pushing my limits. My little sister Dr.Komal Agarwal and Bimlesh Mour for always being on my side and believing in myself more than I do.

To the real heroes behind this project- my patients and their caregivers, especially Col.A.K Tiwari Sir and Mrs.Vanaja Nambiar Ma'am whose determination and transformative changes through PR journeys ignited the establishment of an award winning and globally accredited PR service centre in India. I sincerely hope this unique concept inspires generations to come and India gets many Pulmonary Rehabilitation centres which ease the human misery and improves the quality of life of our people.

I bow down to the divine for choosing me as an instrument in making a huge contribution to our society through this business administrative research work and handholding me through this miraculous metamorphosis. I surrender to the universe to bless mankind with abundant health and live in a peaceful world as one big family!

**ABSTRACT**

EXPLORING THE PERSPECTIVES OF HEALTHCARE PROFESSIONALS(HCP)

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JAN 2023 – JAN 2026

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The healthcare business industry is quite unique compared to other business sectors and its primary goal is not just profit, as healthcare is an essential human right and needs to focus on enhancing Quality of Life of its beneficiaries. Rehabilitation Medicine is an emerging and highly significant business vertical in the healthcare industry, however, the need for rehabilitation is largely unmet especially in the developing countries.

Chronic Respiratory Diseases (CRDs) represent a major global health burden. Pulmonary Rehabilitation (PR) is an evidence-based non-pharmacological intervention for managing CRDs. Globally, PR service availability is critically low, and its awareness is extremely limited in a developing country like India though CRD is the 2<sup>nd</sup> leading cause of death and disability, making it a nationwide public health threat requiring immediate attention. Despite the strong scientific recommendations, referral to and uptake of PR programs remain disproportionately low, and implementation of PR service remains inconsistent. Health care professionals (HCPs) play a very important role in aiding PR as a sustainable business model. This study explores the perspectives of HCPs on PR services, focusing on their beliefs, referral practices, perceived barriers and potential strategies to facilitate PR business implementation as a frontier healthcare vertical.

In response to this gap, we established a unique pulmonary rehabilitation facility, aligned with globally accepted, evidence-based standards. A Kaizen-based continuous improvement method was used to gradually increase program quality, and longitudinal clinical audits were used to track program efficacy. The viability of PR as a long-term service delivery strategy was established by consistently positive clinical performance, rising service uptake, and high patient happiness as determined by Net Promoter Scores. The importance of healthcare professionals in facilitating scalability was brought to light by this practical implementation experience, which inspired the current study to investigate the opinions of care providers regarding the adoption of PR services in India.

A quantitative descriptive cross-sectional survey was conducted among HCPs (n=232) involved in CRD management. As per our knowledge, this is the first-of-its-kind comprehensive Indian study, encompassing 23 different disciplines comprising both clinical fraternity and administrators. A structured questionnaire based on 5 pointer Likert scale assessed knowledge, attitudes, beliefs, referral practices and implementation perspectives.

The study showed that healthcare professionals had a high level of knowledge and professional confidence on pulmonary rehabilitation. Overall, 69% of respondents said they were prepared to refer eligible patients, and 73.2% of respondents assessed their understanding of PR eligibility requirements at  $\geq 8$  on a 10-point scale. The availability and accessibility of PR services in India were assessed low when compared to worldwide standards (mean score 1.75/10), despite a significant consensus regarding the necessity for high-quality PR centers in India (mean score 9.08/10). Clinical severity and functional impairment were the main factors influencing referral decisions, whereas systemic and patient-level obstacles, such as restricted access to PR centers, transportation difficulties, and patient refusal, were the main causes of non-referral rather than a lack of faith in PR efficacy.

Most HCPs acknowledged the benefits of PR services but barriers such as awareness, unclear referral services, inadequate resources, and poor access limits integration into routine CRD care in the healthcare industry. Preliminary findings indicate variability in awareness among HCPs with respiratory specialists demonstrating greater familiarity compared to other potential referral and service providers.

Addressing gaps in awareness, role clarity, and resource allocation, alongside developing accessible PR business models in India, is crucial to strengthen referral practices, optimize patient participation and outcomes. There is tremendous potential for establishing high quality PR delivery centres across Indian healthcare industry, which could contribute in alleviating the disease burden nationally and globally. It is an emerging business model,

easily adaptable even in the low resource settings of developing countries. India could set an example of a sustainable healthcare model by establishing robust policies, availability and accessibility of PR services for those suffering from crippling chronic conditions by improving their overall health status to lead a dignified life and this study's implications pave way for the same. Alleviating human suffering is the best that scientific business studies could contribute to building a nation that prioritizes its people's health.

Keywords: Pulmonary Rehabilitation, Chronic Respiratory Disease, Healthcare Professionals, referral practices.

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## CHAPTER I:

### INTRODUCTION

#### **1.1. The uniqueness of Healthcare Industry**

The healthcare industry includes clinical care providers like physicians, nurses, allied healthcare professionals, paramedical staff and administrative staff, working cohesively through hospitals, specialty clinics, skilled nursing homes, primary health centres, non-government organizations, telemedicine, medical diagnostic centres, long-term care centres, home healthcare establishments etc. There are various attributes for the healthcare industry which uniquely distinguish it from other business sectors. The key differentiators are deeply rooted in their moral and social imperative, complex nature of trade as well as economic and regulatory organization. The healthcare industry has an inherent moral and ethical prospect that conflicts with mere economic profits. Primary goal is not just profit as healthcare is an essential human right and needs to converge on enhancing Quality of Life of its recipients. Therefore, the performance indicators also must balance out economic survival with ethical and Quality of care fundamentals.

In contrast to a typical competitive market, the customer is usually unfamiliar about the disease and treatment alternatives, as the provider only holds majority of such knowledge and proficiency. Healthcare is a necessity and not a luxury and when faced with a chronic sickness, the demand is not reduced even if the price is very high. There is no room for errors as it could have devastated impact on the patients as well as society at large. Current trends in business models are focusing away from volume to that of value-based care which mandates extensive organization, monitoring and measurements, all of which are not a typical requirement in other industries. The patients' vulnerability calls for a high level of ethical compulsion for transparency and to safeguard patients' well-being over profit expectations.

In contrast to single transactional purchase, healthcare often requires long term associations with patients and caregivers through the entire care continuum across multiple provider settings and such traits certainly make the healthcare sector incomparable as an industry.

## **1.2. Rehabilitation Medicine – An emerging healthcare business vertical**

Rehabilitation medicine offers high potential market opportunities across the globe and particularly so in the developing countries like India, where it is predicted to boom over the next five to ten years to meet the growing healthcare demands of one of the largest populations in the world.

Rehabilitation is defined as “a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment” (World Health Organization, 2024).

In short, rehabilitation makes it feasible for a child, adult, or elderly person to participate in education, employment, leisure activities, and important life duties like caring for a family. It accomplishes this by working with the individual and their family to address underlying medical conditions and symptoms, adjusting their surroundings to better meet their needs, utilizing assistive technology, educating them to improve self-management, and modifying tasks to be completed more safely and independently. When combined, these techniques can assist a person in overcoming challenges related to thinking, seeing, hearing, speaking, eating, or moving. At some point in their lives, everyone may require rehabilitation due to an injury, surgery, disease, or illness, or because their functioning has deteriorated with age. (World Health Organization, 2024).

Rehabilitation sciences are undervalued in India, and it is still in its infancy. The awareness is quite poor among public as well as all other stakeholders and it is mostly seen only as a support service and not a mainstream healthcare clinical segment. It has potential applications in prevention, restoration and optimizing an individual to be an active contributor in a bio socioeconomic context. The national care burden will drain the country of its economic resources as the disabled population increases, and all measures must be taken to provide equitable and accessible healthcare to all. Rehabilitation is one such high potential discipline that caters to the wide spectrum of population – from that of the weakest paralyzed person to the strongest athlete for improving his/her sporting performance.

“There are, however, misconceptions around rehabilitation. Professionals view rehabilitation as a generic treatment and fail to specifically identify the services that make it up. Recognising the origins of rehabilitation within a biomedical healthcare system, we must implement it within a biopsychosocial framework. The conventional healthcare system emphasises disease detection and treatment, sometimes overlooking the wider implications of illnesses. While there is no motivation for rehabilitation in the current population, research suggests that medical care should incorporate rehabilitation from the outset and that prophylactic rehabilitation could be beneficial before surgery” (Ganesh, 2025).

### **1.2.1. 360° Holistic Rehabilitation Service Model**

A Holistic Rehabilitation Care Model is a comprehensive and integrated service organization of contemporary model of rehabilitation that caters to the physical, emotional, social, and spiritual requirements of persons with disabilities or impairments. No two individuals are same and therefore would have unique requirements as they travel through their rehabilitation journey. Therefore, the rehabilitation concept must be a Person-centered or Person-driven care model. A Holistic Rehabilitation Care Model encompasses objectives

of Physical rehabilitation, psychological rehabilitation, social rehabilitation, spiritual rehabilitation, vocational rehabilitation, and leisure and recreational activities and reinstates to the best possible Quality of Life by re-integrating to a meaningful community-based living. The unique advantages of such a Holistic Rehabilitation Care Model include improved functional outcomes, reduced healthcare expenses, enhanced quality of life, and optimal satisfaction among clients, families, and caregivers.

Below figure is a pictorial representation of this contemporary concept that considers not only the physical symptoms but also the emotional, mental, and social dimensions of a customer's well-being and considers the whole person, resulting in optimal recovery outcomes.



Figure 1 360° Holistic Rehabilitation Care Model

The idea of integrating culture specific therapies and clinical expertise, patients receive a meaningful and supportive care experience. (Sivapalan, 2025). I have conceptualized this unique design over many years of meaningful collaborations with rehab care experts. This visionary concept could pave way for care delivery systems that best suit the Indian healthcare landscape. (Design conceptualization and Picture Courtesy: Dr.Saril.V.S(PT) and Dr.Maheswarappa.B.M (PMR), Chapter- “Management of Rehabilitation Services”, Unit 17, Block-4, MHH 012: Clinical & Diagnostic Services, MBA (Health Care and Hospital Management), School of Health Sciences, Indira Gandhi National Open University-IGNOU)

### **1.2.2. Global rehabilitation needs**

An estimated 2.4 billion people worldwide suffer from a medical ailment that could be helped by rehabilitation. Around the world, the need for rehabilitation is expected to rise because of changes in population demography and health, with people living longer but experiencing more chronic illnesses and disabilities. The need for rehabilitation is currently mostly unfulfilled. Over half of the population in certain low- and middle-income nations does not obtain the necessary rehabilitative services. Conflicts, natural catastrophes, and outbreaks are examples of emergencies that impair rehabilitation services and cause massive spikes in rehabilitation demands. In order to achieve Sustainable Development Goal 3, rehabilitation is a crucial component of universal health coverage “Ensure healthy lives and promote well-being for all at all ages” (World Health Organization, 2024).

The lack of national prioritization, funding, policies, and plans for rehabilitation, the absence of rehabilitation services outside of urban areas, lengthy wait times, high out-of-pocket costs, and insufficient or nonexistent funding sources, the scarcity of qualified rehabilitation professionals (less than 10 skilled practitioners per million population in many

low- and middle-income settings), and the lack of resources, including assistive technology, equipment, and consumables, the need for more research and data on rehabilitation, and ineffective and under-utilized referral pathways to rehabilitation (World Health Organization, 2024).

As the life expectancy increases across the globe, the need for structured rehabilitation services increases. The requirements vary from country to country but the basic need for rehabilitation to be integrated to traditional healthcare systems is increasing. There is certainly huge demand for the skilled manpower especially in the countries with higher populations to bridge the disparity in client clinician ratio.

### **1.2.3. The global medical rehabilitation services market size**

The market for medical rehabilitation services is anticipated to increase at a compound annual growth rate (CAGR) of 6.14% from 2024 to 2030, from an estimated USD 254.82 billion in 2023 to USD 385.92 billion by 2030. Over the course of the forecast period, the medical rehabilitation services market in Asia Pacific is expected to develop at the fastest rate. The region's need for these treatments is fueled by an increase in injuries and musculoskeletal diseases brought on by sedentary lifestyles and urbanization. The demand for medical rehabilitation services in India has increased recently. Demand in India is being driven by the rising incidence of non-communicable diseases like diabetes, musculoskeletal problems, and cardiovascular diseases (Grand View Research, 2022).

India's physical rehab industry is predicted to reach \$35 billion by FY2028 at a compound annual growth rate (CAGR) of 15.5% over the next five years. The \$17 billion Indian market for physical rehabilitation is now divided into three main segments: pain

management (\$3–4 billion market), geriatric care (\$5 billion market), and restorative care (\$5 billion market). The rehab industry is in dire need of specialized players. Specialized firms must have strict control over the onboarding and training of their medical staff in order to grow in this industry, as they are crucial to the quality of the customer experience (IANS 2023).

It is evident that the Indian healthcare sector needs to focus on rehabilitation as a frontier specialty to minimize the care burden and facilitate community integration of persons with disabilities (PwDs) in the coming years. The demand is growing and we must prepare to cater to the vulnerable population to embrace an inclusive society in the modern world.

#### **1.2.4. The Rehabilitation 2030 initiative and call for action**

Launched by the World Health Organization (WHO) in February 2017, the Rehabilitation 2030 program offered a "call for action," mobilizing stakeholders toward coordinated and coordinated worldwide measures to scale up rehabilitation. This program emphasizes the significance of bolstering health systems to deliver rehabilitation and calls attention to the enormous unmet need for rehabilitation around the globe. Rehabilitation may be beneficial to one in three people worldwide. By highlighting the idea that rehabilitation should be accessible to everyone and at every stage of life, the initiative represents a new strategic approach for the worldwide rehabilitation community. Supporting the health system and integrating rehabilitation into all tiers of healthcare should be the main goals of efforts to improve rehabilitation. In order to achieve universal health coverage, rehabilitation is a vital health service. Rehabilitation is a 21st-century priority health strategy that specifically helps to maximize population functioning due to aging populations and an increase in the number of persons with chronic illness (WHO, 2017)

The Rehabilitation 2030 initiative is an important call out for more focused efforts in actioning a great vision. The sustainability and scalability of rehabilitation services across the globe is an urgent need that emphasizes on collective action from all the key stakeholders. India must wake up to this reality and policy makers, and healthcare providers need to come together to initiate a clear action plan that could transform our nation's health status by prioritizing rehabilitation business vertical in all healthcare systems and establishments.

The Non-Communicable Disease burden is a massive global problem as chronic diseases like Diabetes, heart diseases, cancer and pulmonary disorders pose major cause for premature death rates and disability, especially in the Low Middle-Income Countries. It is driven by changing lifestyle habits and pollution and drain individuals for high healthcare costs and nations lose its productive manpower along with an increased care burden.

### **1.3. Chronic Respiratory Diseases (CRDs) - A rapidly Emerging Public Health Crisis**

Chronic Respiratory Diseases are a spectrum of obstructive or restrictive respiratory conditions that cripple people with high mortality and morbidity rates. Most of them silently succumb to a passive dependent life and resort to pharmacotherapy or Oxygen therapies with a natural worsening of the disease condition. People suffering due to respiratory conditions were not much in the focus until Covid-19 hit the world with Post Covid Sequelae adding onto the burden of existing care burden of CRDs

The lungs' airways and other structures are impacted by chronic respiratory disorders (CRDs). Asthma, occupational lung illnesses, pulmonary hypertension, and chronic obstructive pulmonary disease (COPD) are some of the most prevalent CRDs. Apart from tobacco smoke, other risk factors include dust and chemicals in the workplace, air pollution, and childhood lower respiratory illnesses. Although there is no known cure for CRDs, patients can manage their symptoms and live better lives using a variety of treatments that

assist with expanding their airways and alleviate shortness of breath. "A world in which all people breathe freely" is the objective of the WHO Global Alliance against CRDs (GARD). The needs of individuals with CRDs in low- and middle-income countries (LMIC) are the main emphasis of GARD.

The WHO Chronic Respiratory Diseases Programme's goal is to assist Member States in lowering the burden of morbidity, disability, and early death associated with long-term respiratory conditions, particularly asthma and chronic obstructive pulmonary disease. While there is no cure for either COPD or asthma, treatment can lessen symptoms, stop worsening, and increase participation in everyday activities. With 3.5 million deaths in 2021 - roughly 5% of all deaths worldwide - chronic obstructive pulmonary disease (COPD) is the fourth most common cause of mortality. Low- and middle-income countries (LMIC) account for over 90% of COPD fatalities among individuals under 70. According to disability-adjusted life years, COPD ranks as the ninth most common cause of poor health globally (World Health Organization, 2019).

According to predictions from modeling research of the future burden of COPD, hundreds of millions of people worldwide would still be affected by the disease through 2050, with a disproportionate increase among females and in low-middle income areas. According to the projections, there would be 600 million COPD patients worldwide by 2050, a 23% rise from 2020 to 2050 among people 25 years of age and older. To address these concerns and enable proper planning and resource allocation, more research, prevention, and advocacy are required. In general, LMICs seem to be experiencing a far faster increase in COPD cases than High Income nations (HICs),

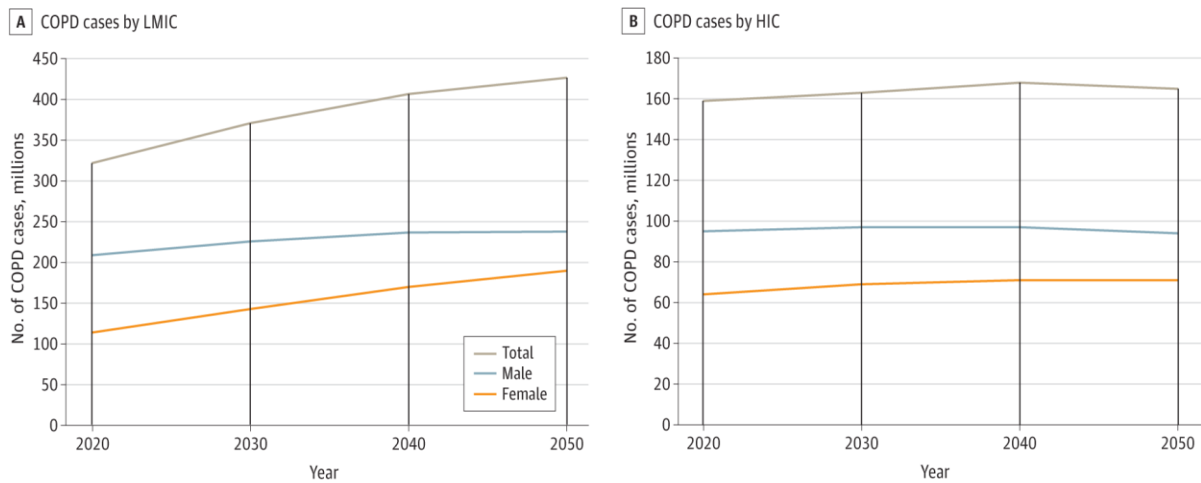


Figure 2 Chronic Obstructive Pulmonary Disease (COPD) Cases Calculated Based on Generalized Additive Models Prevalence Estimates Across Low- and Middle-Income Countries (LMICs) and High-Income Countries (HICs)

which were projected to observe a more modest growth from 2020 to 2050 (Boers *et al.*, 2023).

### 1.3.1. Care burden of Chronic Respiratory Diseases (CRDs)

Chronic Obstructive Pulmonary Disease (COPD), a noncommunicable disease that affects over 380 million people worldwide, silently taking over 3 million lives annually. Though COPD is common, there is still a lack of access to inexpensive care, particularly in low- and middle-income nations where nearly 90% of COPD deaths take place. This needs to be altered. Globally, nations have begun to recognize the impact of COPD and include it in their national health agendas. Like other noncommunicable illnesses, COPD requires immediate attention, and national leaders should place a high priority on ensuring that everyone has access to COPD prevention and care. Now is the moment to take action against COPD. We can prolong lives, enhance quality of life, and build healthier communities globally by making action against this silent killer a top priority (World Health Organization, 2024).

In the low- and lower-middle income countries (LMICs), especially in East Asia and Oceania, the high age-standardized rates of deaths and Disability-Adjusted Life Years (DALYs) from CRDs underscore the deficiencies in prevention, diagnosis, and management and call for additional research and strategies to improve respiratory care (Momtazmanesh et al., 2023).

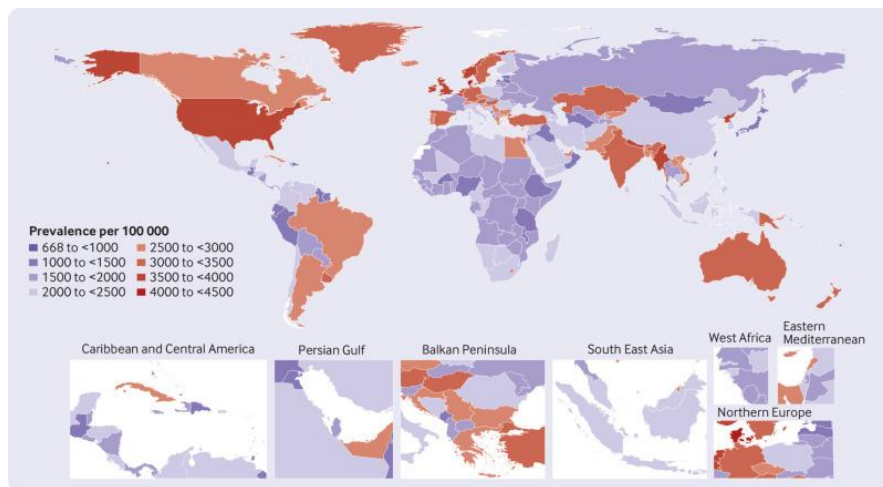


Figure 4 Age standardized point prevalence of chronic obstructive pulmonary disease per 100 000 population in 2019, by country (generated from data available at <https://ghdx.healthdata.org/gbd-results-tool>)

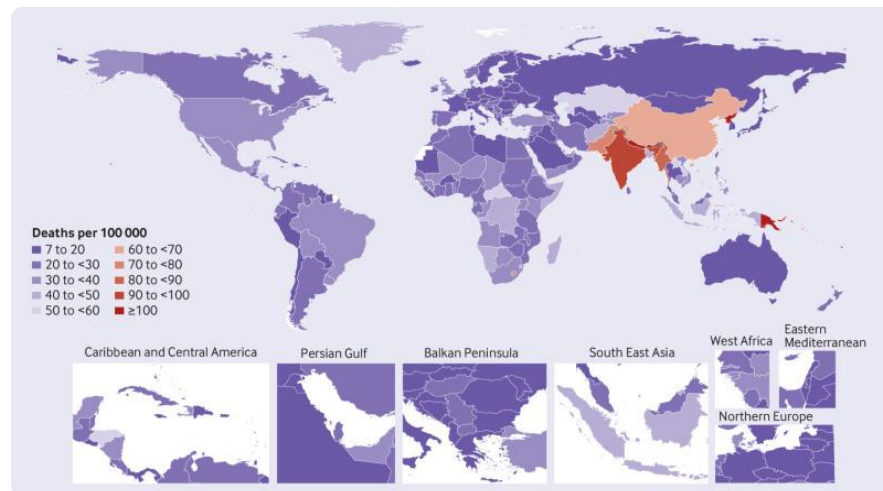


Figure 3 Age standardised death rate of chronic obstructive pulmonary disease per 100 000 population in 2019, by country (generated from data available at <https://ghdx.healthdata.org/gbd-results-tool>)

Smoking (46.0%), ambient particulate matter pollution (20.7%), and occupational exposure to particulate matter, gases, and fumes (15.6%) were the factors that contributed most to the DALYs rates for COPD. To further lessen the burden of COPD, preventive programs should concentrate on quitting smoking, enhancing air quality, and lowering occupational exposures (Safiri et al., 2022).

The concept of "care burden" describes the financial, mental, and physical constraints that patients, caregivers, and medical professionals must deal with. The most thorough assessment of the epidemiological characteristics of non-communicable diseases (NCDs) to date is offered by the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD). Chronic respiratory disorders (CRDs) are a significant burden and cause premature mortality globally among NCDs. According to the 2019 Global Burden of Disease (GBD) study, chronic respiratory diseases (CRDs) accounted for 4.0 million deaths worldwide, making them the third most common cause of death. Smoking continued to be a major risk factor for CRD-related mortality and disability, with Chronic Obstructive Pulmonary Disease (COPD) being the predominant cause of CRD deaths (Momtazmanesh et al., 2023).

### **1.3.2. Why should we worry about CRD in India?**

According to Bureau (2024), Diseases of the Respiratory System is the largest disease area in India, constituting 15.3% of all treatment of total patients with diseases in India.

Chronic obstructive pulmonary disease (COPD) is India's second most common cause of mortality and disability-adjusted life years (DALYs), according to the global burden of disease (GBD) report. Over 9.5% of all fatalities in India are caused by COPD alone (GBD 2019 Report). More than half of all chronic respiratory diseases in India are caused by COPD, which also accounts for 70% of years of life spent disabled (Salvi and Ghorpade, 2021).

In India, 120 million people smoke tobacco; more than 60% of people live in homes where biomass fuel is still used for cooking or heating; between 56% and 76% of households use various types of mosquito repellents; more than 35 million people work in the dusty building and construction industry; road sweepers, hawkers, drivers of rickshaws, taxis, and buses; and traffic police officers are all regularly exposed to elevated ambient air pollution. In India, pulmonary TB and untreated asthma, two significant risk factors for COPD, are very common (Salvi and Ghorpade, 2021).

**COPD causes an economic loss of more than 100 thousand crore rupees (USD 13.4 Billion) per annum in India.** It is important to formulate appropriate policy decisions to reduce the health-related costs of COPD in India (Madas *et al.*, 2022).

India must now take COPD very seriously. "Implementation of locally adapted cost-effective pulmonary rehabilitation programs should be an international priority" is one of ten specific recommendations presented at a recent American Thoracic Society meeting for a nation like India to effectively address COPD. Additionally, it suggests that in order to enhance respiratory health worldwide, the respiratory community should make use of the expertise and passion of earlier-career physicians and researchers. If put into practice, the American Thoracic Society's recommended plan will greatly lessen the prevalence of COPD in India. Before the impact of COPD overwhelms our healthcare system and economy, it is necessary to start treating the disease seriously (Salvi and Ghorpade, 2021).

### **1.3.3. The global respiratory disorders treatment market size**

According to BioSpace (2022), the global respiratory disorders treatment market is expected to grow to a size of US\$125.63 billion by 2030 due to a number of factors, including an increase in the incidence of respiratory disorders, a surge in supportive care

products to meet the rising demand for treatment of respiratory disorders, the entry of new players, and an increase in access to healthcare.

Despite being mainly avoidable and underdiagnosed, Chronic Respiratory Diseases (CRDs) have a significant economic burden, high morbidity, and mortality rates both nationally and internationally. Particularly for vulnerable populations impacted by tobacco use, air pollution, and limited access to care, effective management can save healthcare costs, improve quality of life, and decrease hospitalizations.

In persons with Chronic Respiratory Diseases (CRDs), the health condition deteriorates as these diseases progress, and they are currently incurable. Even with pharmacological management, the Quality of Life (QoL) of clients continues to deteriorate which impacts psychosocial factors and places increased demands on caregivers. Therefore, it is utmost necessary to design, develop and implement effective strategies to prevent, diagnose, and manage CRDs.

“National health strategies and financial allocations must incorporate rehabilitation, thereby advancing the objective of universal health coverage. There should be effective service delivery models, encompassing referral systems across various levels of the health system and between community and hospital-based services. Further, the substantial deficiencies in the evidence base for rehabilitation necessitate a major enhancement of research support. Significant shortcomings in the evidence for rehabilitation policy and planning, including the elucidation of cost-benefit analyses, the identification of facilitators and barriers to rehabilitation access, the determination of the severity of unmet demands, and the establishment of a standardised measure of rehabilitation impact, require additional study.” (Ganesh, 2025).

**The coming years are going to need high quality rehabilitation services across the nation** which demands Healthcare Professionals to have deeper understanding of disease burden and prepare themselves to provide adequate facilities that reach even the remote communities. Specialty based rehabilitation centres across the urban and rural areas could be established as an Inpatient Rehabilitation Facility (IRF), Outpatient based Day-care centre, transition care centre, palliative long term care centre or home care service model. More research is needed to analyse the adaptability of different service models that fits into the public or private healthcare delivery systems.

The most scientifically evidenced current treatment approaches often include pharmacological care (bronchodilators, steroids, antibiotics), Oxygen Therapy, inhaler therapy, lifestyle regulation (smoking cessation, diet, hydration), Pulmonary Rehabilitation and sometimes surgery (lung transplant).

#### **1.4. Pulmonary rehabilitation service: Theoretical foundation and evidence base**

As defined by the 2013 ATS/ERS Statement on Pulmonary Rehabilitation, PR is “a comprehensive intervention based on a thorough client assessment followed by person tailored therapies that include, but are not limited to, exercise training, education, and behaviour change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviours.” Pulmonary rehabilitation reduces patients’ symptoms and improves their exercise tolerance and health-related quality of life.

##### **1.4.1. Essential Components of Pulmonary Rehabilitation Service Bundle**

(1) Exercise training: muscle strengthening, increases cardiovascular fitness, and improves exercise capacity and lessens dyspnoea. Consists of resistance, aerobic, and

respiratory muscle training

(2) Education: Provides knowledge about the disease, medications, and self-management. Teaches breathing techniques, energy conservation, and nutrition. It empowers clients to recognize and manage symptoms and exacerbations.

(3) Behavioural Change: Encourages the development of long-term healthy behaviours (such as quitting smoking and exercising) and addresses psychological issues like depression and anxiety. It promotes treatment compliance and lifestyle changes.

PR is an evidence-based treatment with meaningful, repeatable, and interpretable results that is based on well-designed clinical trials and is anchored in aerobic exercise training. Professional societies worldwide advise PR as a crucial part of the clinical treatment of COPD patients. Other respiratory conditions, such as pulmonary fibrosis and other interstitial lung diseases, pulmonary hypertension, cystic fibrosis, bronchiectasis, restrictive chest wall disease, asthma, lung cancer, post-COVID-19, and preparation for or recovery from thoracic surgery (such as lung resection, lung volume reduction surgery, and lung transplantation), are also supported by solid scientific evidence. PR has been shown to provide more benefits for important person-centered outcomes in COPD than pharmaceutical treatments (American Thoracic Society, 2024).

#### **1.4.2. Health economics- benefits and cost effectiveness of pulmonary rehabilitation**

Not only is pulmonary rehabilitation clinically beneficial, but it is also quite economical, especially when it comes to treating chronic respiratory conditions like COPD. Because fewer hospital admissions, Emergency Room (ER) visits, and illness exacerbations occur and are less severe, it dramatically lowers healthcare utilization. PR reduces recurrent hospital admission costs, length of hospital stays, emergency visits, primary care consultations for prolonged symptoms. Some of the indirect benefits of PR include – fewer

sick days, enhanced capacity for work etc. Exercise capacity and quality of life are both enhanced by pulmonary rehabilitation, which lowers hospitalization and emergency admission rates. In addition to medical therapy, PR should be included in the management of patients with chronic respiratory disorders due to the expense of hospitalization (Ozmen et al., 2018).

**Reduction in hospitalizations and healthcare utilization:** Shorter hospital stays and fewer readmissions result from pulmonary rehabilitation, which significantly lowers costs for healthcare systems. Additionally, PR promotes increased independence and lowers the need for long-term care by enhancing patients' functional status and quality of life.

### **1.4.3. Contemporary PR models and business approaches**

**Institutional -based programs:** In institutional, centre-based pulmonary rehabilitation (PR), scheduled exercise and education sessions are given at hospitals or outpatient clinics, usually two to three times a week for six to twelve weeks. These programs use a multidisciplinary approach, with nurses, respiratory therapists, physiotherapists, and other medical professionals leading supervised sessions. Clients engage in strength training, breathing exercises, aerobic training (e.g., cycling, treadmill), and instruction on disease management, nutrition, and psychological support.

**Emerging Models - Telerehabilitation & Home-Based Programs:** Telerehabilitation provides PR remotely through digital platforms like wearable technology, mobile applications, and video chats. Through virtual sessions, monitoring, and feedback, it enables real-time communication between clients and physicians. In home-based PR programs, a physiotherapist visits customers at their residence and provides pulmonary rehabilitation.

#### **1.4.5. Pulmonary Rehabilitation business establishments; the need of the hour**

The need of the hour is the establishment of more pulmonary rehabilitation specific centres all over the country. In this digital age, it is easier to spread awareness about the benefits of these programmes in India (Bureau, 2019). There is huge potential for Pulmonary Rehabilitation to be established as an evidence based clinical specialty and flourish as a practical business idea across India and similar developing countries.

In the southern region of India, the idea of PR was likely included into COPD treatment in the 1990s. Nonetheless, it was implemented at the start of the twenty-first century. Even said, there is currently a shortage of efficient PR application in clinical practice in India. Given its demonstrated advantages, PR should be made more accessible in order to lessen the functional burden of disease, related disability, and financial loss brought on by COPD (Bhadra et al., 2021).

Variability and difficulties in pulmonary rehabilitation procedures throughout India were identified by a nationwide survey (Japi.org, 2025). The observed PR variability suggests a disjointed system devoid of conventional operating procedures. The fact that most centers have lower caseloads suggests that PR services are underutilized, possibly because of issues with customer outreach and referrals. Lack of standards, poor interdisciplinary coordination, accessibility concerns, and low awareness were among the main obstacles. There were different structural components, such as unequal resource allocation and inconsistent team compositions. Regular audit meetings were held by only 36% of centers, and many of them lacked basic emergency supplies. The survey emphasizes the necessity of national norms and regulated procedures to raise the caliber and uniformity of PR services in India. Emphasizing multidisciplinary teams, regular audits, and comprehensive data collection can enhance PR delivery and outcomes.

Translation of PR into clinical practice is not only poor in developing countries like India but also in developed countries. **Internationally, the utilization of PR is in only 1–2% of the total COPD population.** Given the prevalence of this illness and the noted advantages of PR, this is quite remarkable (Bhadra et al, 2021).

The profound clinical benefits of Pulmonary Rehabilitation delivery are very well documented in published literature. Despite this, knowledge transfer may not apply well to a middle or low resourced setting due to significant differences in the cultural context, healthcare infrastructure, governing policies and socio-economic factors. Therefore, it is of paramount significance to practically establish a unique Pulmonary Rehabilitation Care model in India to set a ready reckoner framework of guidelines and quality standards for other healthcare organizations to easily replicate and widen the reach to persons affected with CRDs.

Regular outpatient clinics, emergency rooms, and intensive care units are usually prioritized over rehabilitation centers. The labor-intensive, time-consuming, and long-term nature of rehabilitation programs is one of the causes of this. Conversely, in the crucial situation of a patient in the intensive care unit, the outcomes are nearly immediate and profitable. It's crucial to remember that rehabilitation is less expensive than regular care, even though it takes longer.

Below is the real-world integration of such a programme in India at a tertiary care hospital, developed a sustainable model through systematic Kaizen approach which added many innovative elements like India's own Yoga Therapy Protocols. We have mobilized the existing resources which did not incur additional costs for establishing this service line. Further the effectiveness of this continuous quality improvement initiative is evaluated against globally set Clinical Audit standards and benchmarks. This exercise enabled us to get much deeper understanding of the practical challenges and how to overcome them and adapt

to our cultural and socio-economic context as a sustainable quality-oriented business model.

#### **1.4.6.CASE STUDY** on improving quality for a sustainable PR business model in India

### **A real-world business establishment through Quality Improvement of Pulmonary Rehabilitation service model in a Developing Country**

Although it can be difficult to develop a pulmonary rehabilitation program in high disease burden and resource-constrained settings, starting the program with minimal resources and progressively expanding the facility will undoubtedly lower healthcare utilization and improve long-term quality of life for patients with chronic respiratory diseases (Bansal, 2016).

In a developing country like India, PR is not included in the integrated care of persons with CRD. There is no structured PR practiced in India and national clinical guidelines on program structure, process or the clinical outcomes does not exist. With a Kaizen mindset, we established a person centric, quality driven multi-disciplinary PR program utilizing the available resources.

Kaizen approach and “out of box thinking” made us to establish an Innovative idea – Comprehensive Pulmonary Rehabilitation as a business vertical. Every single customer interaction posed challenges but offered opportunities to repeat Plan-Do-Check-Act (PDCA) cycles to refine the project, periodically. It evolved through meticulous revision in the team, process, structure, protocol and outcome measures. We mobilized both clinical and non-clinical team members in a phased manner as per the requirements of repeated PDCA cycles and formed a dedicated team comprising almost 40 members.

**Evaluating the effectiveness of Kaizen initiatives through Clinical Audits:** The clinical audits were conducted to identify gaps against global benchmarks and sustain/improve care delivery to ensure clients achieve optimal clinical outcome and a

positive experience. Unlike conventional clinical audits which focuses only on a single standard, this PR clinical audit is aimed at a comprehensive approach encompassing all the 3 core areas of clinical audits - structure, process and outcome. It focused on every customer touchpoint in the clinical care pathway to create an all-inclusive approach for total-quality impact.

After thorough literature review, relevant Standards pertaining to program structure, process adherence and clinical outcome were based on references from the global quality guidelines and Accreditation bodies such as British Thoracic Society (BTS), American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR), National Institute for Health and Care Excellence (NICE) Quality Standards Process Guide, Royal College of Physicians Pulmonary Rehabilitation Clinical Audit. Corresponding to the clinical care pathway, there were a total of 10 core standards for clinical audit – 8 global and 2 organizational. Each standard was carefully chosen by multiple brainstorming sessions, considering its Critical-to-Quality (CTQ) relevance in the ‘Clinical Care Pathway’ to ensure customer safety and improve process adherence for optimal outcome.

Effectiveness of Kaizen based business sustainability alongside global quality drive: The annual Clinical Audits helped us to identify critical areas of improvement, analyse the effectiveness of implemented interventions and quantify the impact on client’s Quality of Life.

Table 1 Effectiveness of the Quality Improvement initiatives measured through Clinical Audit Results

QS No	Standard/Criteria outline matching Clinical Care Pathway	Target	2021			2022			2023			Global Data(UK)	Audit gain/Decline ▲ ▼
			n=18 (180 sessions)			n=36 (395 sessions)			n=49 (662 sessions)				
			1st Audit finding (%)	1st Re-audit finding (%)	2nd Re-Audit finding (%)	1st Audit finding (%)	1st Re-audit finding (%)	2nd Re-Audit finding (%)	1st Audit finding (%)	1st Re-audit finding (%)	2nd Re-Audit finding (%)		
1	Screening and counselling for Uptake	60	32	45	66	31	▲	34					
2a	Timely enrolment of COPD patients	85	83	100	100	40	▲	17					
2b	Timely enrolment of non COPD patients	85	83	100	100	Not available	▲	17					
3	Baseline Assessment	100	100	100	100	57.2	Sustained						
4	Individualized Therapy Plan (ITP) Dosage	100	83	100	100	81.2	▲	17					
5a	ITP - Aerobic Exercise Therapy	100	83	100	100	81.2	▲	17					
5b	ITP - Resistance Training	100	83	100	100	81.2	▲	17					
5c	Structured Patient Education	100	17	81	100	84	▲	83					
6	Programme Adherence & Completion	70	44	67	80	67	▲	36					
7	Endline Assessment	100	88	100	100	67	▲	12					
8a	Clinical Outcome-Functional Capacity	100	71	79	79	57	▲	8					
8b	Clinical Outcome-Dyspnoea Scoring	100	86	92	90	57	▲	4					
8c	Clinical Outcome-Shealth related Quality of Life	100	43	50	64	68	▲	21					
9	Discharge Summary	100	50	88	100	84	▲	50					
10	Care Continuum	100	13	88	100	84.3	▲	87					

Out of 15 audit criteria points, the baseline audit met the target only for 1 criterion. The 1<sup>st</sup> re-audit showed good improvement with target met for 7 audit criteria. The 2<sup>nd</sup> re-audit had significant improvements with target met for 12 audit criteria. The 3 unmet criteria are on direct clinical outcomes which vary based on client factors such as symptom severity, disease progression, tolerance to interventions etc.

Business Growth- Annual PR Uptake (2018 – 2025)

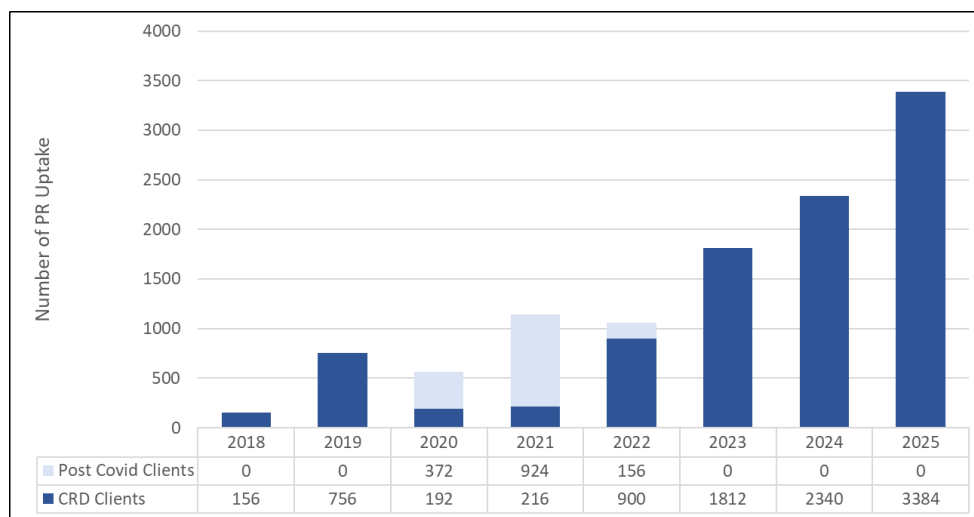


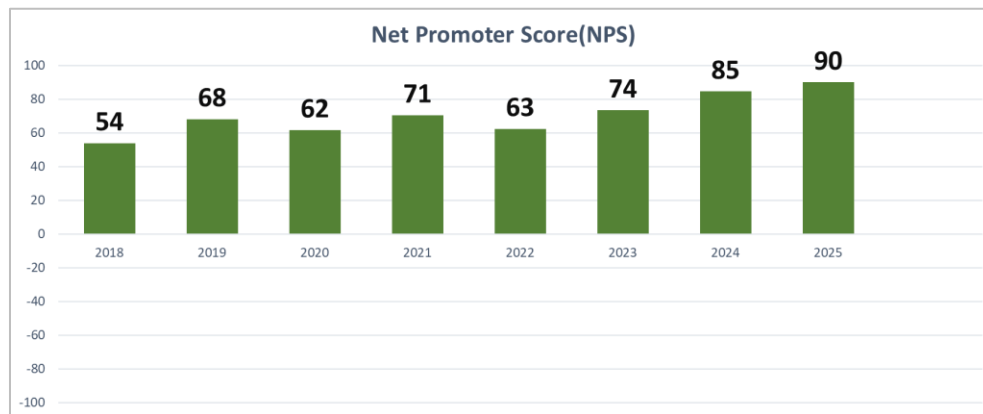
Figure 5 Annual PR Uptake

This is a real-world example of how quality driven persistent improvisations could enhance a sustainable business case for a rare healthcare specialty vertical in India. The referral and uptake gradually improved over the years and what is most striking is the natural dip which happened during the worst pandemic hit by Covid-19. There was no established SOP or care pathway for post covid rehabilitation and that is where the already established Pulmonary Rehabilitation service model came handy. We could quickly adapt the same to cater to the increased patient flow of post covid sequel and this balanced out the business loss due to covid restrictions and lock downs. When all other business verticals like Neuro rehabilitation, Ortho rehabilitation, Paediatric rehabilitation etc. were badly affected, Pulmonary Rehabilitation came to limelight as a robust business vertical which could support the Covid-19 survivors and this establishment became one of the first in the country to adapt PR concepts for this rare condition which we never had heard of or studied in medical literature.

It is evident from the graph how quality driven process improvements paved way for business gains over the years and all the stakeholders got highly motivated and aligned to plug the gaps. This is a testament of the effectiveness of various business strategies that we implemented proactively as well as based on customer feedback and the input from HCPs involved in the care delivery. Management took note of this magnificent growth and rewarded the team which further strengthened their belief in the systems.

The marketing team contributed significantly by creating awareness and one of the key highlights is establishing “ReAspire Club” which is a social support group for CRD customers and caregivers. The support group meetings provided ample opportunities for new recruits to get motivated by early adopters of PR services and the networking helped to bridge gaps between service providers and beneficiaries. Continuous Medical Education (CME) for skill building and Quality Circle(QC) meetings for KPI review and repeating

Plan-Do-Check-Adjust cycles helped to ramp up the clinical services, technology adaptation, inclusion of tele rehabilitation, inclusion of rehab pharmacy(connecting vendors and customers), reducing wastage(MUDA) for process re-engineering, Rewards and Recognition programme all of which helped to systematize and business growth over time.



*Figure 6 Customer Loyalty - Net Promoter Score (enthusiastic supporters versus unhappy customers)*

The real value of a business is in its customer delight, and the above graph is a factual testament of customer loyalty measured through Net Promoter Score (NPS) which shows true loyalty that functions as a predictor of business growth. Above “0” NPS score is good, >20 is favourable, **>50 is Excellent and >70 is considered World-class.**

Customers are asked to rate their experience based on their judgment to recommend the service for others on a scale of 0 - 10. Detractors are those who rate 0-6, Passives rate 7 or 8 and Promoters rate 9 or 10.

$$\text{NPS} = \% \text{ Promoters} - \% \text{ detractors}$$

The Net Promoter Score is calculated by subtracting ‘% of detractors’ from ‘% of promoters’. ‘Passives’ are ignored resulting in a total rating of -100 to +100. NPS provides metrics that reflects customer loyalty for business growth and when coupled with qualitative feedback (Patient Reported Experience Measure – PREM), it provides actionable insights for business sustainability.

This project touches core topic of service excellence to the ultimate customer i.e., patient, by improving quality of life. It is a breakthrough healthcare business model which brings new dimension of collaborative clinical service with focus on person centric approach, positive impact on the overall health status, self-esteem and the zeal to live in persons suffering from chronic lung diseases. It is easy to replicate in other healthcare organization so that benefits reach greater section of clients. It is a quality driven sustainable business model in a rare specialty. Clinical Audits and continuous Quality Improvements form an effective system for business development, where all the stakeholders gain.

#### 1.4.7. To scale PR centres across India – SWOT analysis

Based on the successful implementation of PR in our organization, we wish to take on the mission to scale the business across rest of India to ensure the accessibility and availability improves to the needy. Below is a SWOT analysis done with this intent to take on the further steps

INTRINSIC FACTORS	
STRENGTH	WEAKNESS
<ul style="list-style-type: none"> <li>Scientifically evidenced outcomes</li> <li>Multidisciplinary One-stop solution</li> <li>Flexible mode of deliveries Eg. Tele Rehab</li> </ul>	<ul style="list-style-type: none"> <li>Shortage of skilled staff</li> <li>Infrastructure cost</li> <li>Location sensitivity and accessibility issues</li> </ul>
EXTRINSIC FACTORS	
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>Increasing CRD burden in India</li> <li>Increasing Pollution leading to CRDs</li> <li>Post Covid sequel added to indications</li> <li>Govt focus on Non-Communicable Diseases</li> <li>Technology growth – Smartphone &amp; AI apps</li> </ul>	<ul style="list-style-type: none"> <li>Low insurance coverage</li> <li>Fragmented market with poor quality focus</li> <li>Patient access and adherence issues due to low awareness, family support , travel cost etc.</li> </ul>

Figure 7 SWOT Analysis for PR business scalability

A robust theoretical framework is essential for understanding the complex, multilevel barriers and enablers influencing PR referral, implementation, and customer adherence. Such a framework not only illuminates individual behaviours and knowledge gaps among healthcare professionals and clients, but also addresses systemic and contextual factors within hospitals, communities, and health policy environments. This is therefore absolute must if we must scale up the PR business to reach all the needy CRD population in the country. We must convert the opportunities into sustainable business models across India by carefully working on the threats and weakness and leveraging on the strengths from the SWOT analysis model. **Since the beneficiaries are clueless of such a solution the key is with service providers** – HCPs and that is exactly the reason this study was a dire need to understand their pulse which could help us to make informed strategic decisions for PR business scalability.

## **1.5. Healthcare Professional Perspectives on Pulmonary Rehabilitation services**

### **1.5.1. Professional Awareness and Knowledge of Pulmonary Rehabilitation vertical**

Healthcare professionals play a central role in the implementation and promotion of pulmonary rehabilitation (PR) programs for clients with chronic respiratory diseases (CRDs). Yet, a considerable gap persists in their overall awareness and knowledge of such programs. Research consistently indicates that while specialist clinicians such as pulmonologists and respiratory therapists tend to be familiar with PR's scope and clinical utility, many general physicians and primary care providers remain uncertain about crucial aspects like eligibility criteria and referral pathways (Spruit *et al.*, 2013). This lack of clarity often stems from deficits in medical training curricula, where PR is sometimes only briefly mentioned rather than integrated as a core component of CRD management.

Many primary care practitioners admit to having only superficial knowledge of available PR programs and struggle with client selection, often relying on subjective assessment rather than evidence-based guidelines. Healthcare professionals have expressed the need for standardized information regarding program content, referral protocols, and expected customer outcomes. Despite the growing body of research confirming PR's effectiveness for improving exercise tolerance, dyspnoea, psychosocial outcomes, and quality of life, gaps in translating this evidence into practice remain (Spruit *et al.*, 2013).

Training and educational interventions, such as regular workshops, interdisciplinary case discussions, and online modules, have shown promise in enhancing familiarity with PR (Rochester *et al.*, 2015). Interprofessional education encourages collaboration among physicians, nurses, physiotherapists, and occupational therapists, fostering broader understanding and shared responsibility for referrals.

### **1.5.2. Attitudes and Beliefs About Pulmonary Rehabilitation Service Effectiveness**

The attitudes and beliefs held by health professionals regarding the efficacy of pulmonary rehabilitation significantly influence the likelihood of recommending such programs to eligible clients. Generally, specialists in respiratory medicine and physiotherapy recognize that PR can deliver transformative results for individuals living with chronic respiratory disease, including reductions in symptoms, hospitalizations, and improvements in mental wellbeing (Spruit *et al.*, 2013). However, the level of confidence in PR's outcomes is not uniform across all professional groups.

Some general practitioners or clinicians less frequently involved in respiratory care express skepticism about the tangible benefits of PR or underestimate its capacity to address multidimensional patient needs beyond simple physical reconditioning. Other professionals may lack exposure to the latest research or real-world success stories due to resource

constraints, time limitations, or insufficient networking with PR providers (Singh *et al.*, 2014).

Further complicating the picture is the perception of client suitability for PR. Health professionals often debate which patients are most appropriate for referral, taking into account medical comorbidities, age, motivation, and social support. While evidence suggests that PR is beneficial across a wide spectrum of disease severities, misconceptions about rigid selection criteria persist, sometimes deterring clinicians from initiating referrals (Holland *et al.*, 2021). Another factor influencing beliefs is familiarity with different delivery models; some professionals favor hospital-based programs for perceived safety and structure, while others value community or home-based approaches for accessibility and continuity.

### **1.5.3. Referral Patterns and Decision-Making Processes to influence the business**

Referral practices for pulmonary rehabilitation are shaped by a complex interplay of professional experience, organizational culture, customer factors, and healthcare system dynamics. Despite consensus on PR's benefits, referral rates remain inconsistent, with studies reporting considerable variation across regions and between different provider groups (Holland *et al.*, 2021). Physicians with specialized respiratory training or those working in pulmonary clinics tend to refer customers more frequently, often due to greater familiarity with PR programs and defined referral protocols. In contrast, primary care doctors and non-specialists may hesitate, citing ambiguity over their authority, inadequate knowledge, or perceived lack of program availability. Communication pathways between primary care and specialty services are often poorly defined, leading to missed opportunities for timely and effective referrals.

Decision-making could be further enhanced by streamlined referral protocols, clearer role allocation, digital tools for tracking customer outcomes, and interprofessional

communication. Ultimately, addressing referral patterns requires attention to both the professional context and customer-specific needs, reinforcing the importance of coordinated care pathways and responsive institutional support.

## **1.6. Barriers and Facilitators for PR business: Professional and Institutional Perspectives**

### **1.6.1. Professional-Level Barriers**

Healthcare professional barriers commonly cited in the literature revolve around knowledge gaps, role ambiguity, and operational challenges within clinical practice (Spruit *et al.*, 2013). Such gaps often stem from insufficient coverage of PR in medical and allied health education programs, resulting in poor preparedness and confidence among frontline staff to initiate referrals. Role clarity is another significant issue; some clinicians are unsure whether they possess the authority to refer patients, or they defer responsibility to specialists, creating bottlenecks that delay patient access to PR (Singh *et al.*, 2014).

Limited access to continuous professional development and mentorship perpetuates these barriers. Where ongoing education is lacking or professional networks are weak, knowledge about evolving best practices in PR remains static. Studies note that empowering clinicians through targeted educational interventions, role clarification, and feedback from PR programs substantially increase referral rates and overall engagement.

### **1.6.2. Institutional and System-Level Barriers**

Institutional and systemic factors play a decisive role in shaping the availability and delivery of pulmonary rehabilitation services. Resource constraints are among the most commonly reported barriers, with many healthcare facilities lacking sufficient staffing, equipment, or dedicated space to offer comprehensive PR (Rochester *et al.*, 2015). Financial

limitations and inadequate reimbursement policies further inhibit the establishment and maintenance of these programs, particularly in lower-income or rural settings.

Geographic accessibility is a major concern, as customers living far from urban centers or tertiary hospitals may not have practical access to PR facilities, resulting in pronounced disparities in service availability. Program capacity limitations and waiting times frequently deter both clinicians and customers.

Institutional priorities and leadership commitment also influence PR implementation. Where hospital administration does not prioritize PR, or where quality improvement mechanisms are weak, programs may suffer from underfunding, low visibility, and insufficient integration.

### **1.6.3. Facilitators and Enablers**

Local adaptation, driven consumers, the 2019 coronavirus disease (which included both enablers and barriers), increased awareness and recognition, PR training, and resource support are examples of enablers. Several stakeholders must be included for these enablers to be implemented successfully (Bickton and Shannon, 2022).

## **1.7. Research Problem**

Though there is strong scientific evidence on the benefits of implementing a Pulmonary Rehabilitation programme as a specialty business vertical for people with CRDs, there are gaps in translation of evidence to clinical practice by the healthcare professionals.

Over 90% of the included studies in a 2018 scoping assessment of ten wealthy nations had referral rates of 35% of eligible patients or less. Just 16% of COPD patients in primary

care were sent to pulmonary rehabilitation, according to a more recent UK assessment (Lahham and Holland, 2021). In poorer nations, referral rates seem to be comparable. Only 23% of Ugandan COPD patients and medical professionals were referred to pulmonary rehabilitation, according to a recent study (Katagira et al., 2021).

Although pulmonary rehabilitation is widely endorsed in the literature, significant gaps remain in the understanding and implementation of PR from both professional and institutional perspectives (Spruit et al., 2013). Most available research has focused on quantitative measures of referral rates and program outcomes, but limited qualitative exploration exists of the contextual and organizational factors driving these statistics (Holland *et al.*, 2021).

The main problem we are trying to explore is why there exists gaps between the need for well-established PR centres and its offering by Healthcare Professionals.

### **1.8. Purpose of Research**

The purpose of the survey-based research is to explore the perspectives of Healthcare professionals in terms of their knowledge, attitude, believes and confidence with respect to PR referral and client participation. The ultimate goal of the study is to facilitate the adoption of PR by healthcare professionals (HCPs) to improve its widespread availability, referral pathways, accessibility and adherence which potentially could lessen the CRD care burden in the nation.

### **1.9. Significance of Study**

Translation of PR into clinical practice is not only poor in developing countries like India but also in developed countries. Internationally, the utilization of PR is in only 1–2% of the total COPD population. This is indeed striking, given the burden of this disease and the observed benefits of PR (Bhadra *et al.*, 2021). **With respect to a lack of referrals to the programme, further research should highlight healthcare professionals' perceptions of the referral process, and the views of those in Secondary Care** (Swift *et al.*, 2020).

The profound clinical benefits of Pulmonary Rehabilitation delivery are very well documented in published literature. In spite of this, the knowledge transfer may not apply well to a middle or low resourced setting due to significant differences in the cultural context, healthcare infrastructure, governing policies and socio-economic factors. Therefore, it is of paramount significance to practically establish a unique Pulmonary Rehabilitation Care model in India to set a ready reckoner framework of guidelines and quality standards for other healthcare organizations to easily replicate and widen the reach to persons affected with CRDs.

By gaining insights from HCPs, the research can reveal specific challenges and opportunities to implement actionable strategies which could enhance the wider adoption and uptake of a potential healthcare vertical of Pulmonary Rehabilitation.

### **1.10. Research Purpose and Questions**

The primary purpose of the study is to explore the various perspectives of healthcare professionals on Pulmonary Rehabilitation, specifically trying to understand attributes such as their awareness, attitude, beliefs, confidence as well as enablers and barriers for referring appropriate customers with Chronic Respiratory Diseases. By understanding the roadblocks,

we could potentially convert challenges into opportunities to solve the gap between the need and provision of PR in India.

#### **1.10.1. The key research questions**

- a) What knowledge gaps exist among different types of healthcare professionals regarding referrals, delivery, and evaluation of PR service?
- b) Which professional attitudes and beliefs influence decision-making about PR referral?
- c) What are the enabling factors and challenges perceived by HCPs for referral to Pulmonary Rehabilitation to facilitate business?
- d) HCPs' confidence and preparedness to refer clients for Pulmonary Rehabilitation?
- e) What are the HCPs' recommended strategies and expected support to improve PR referral and participation as a sustainable business model?
- f) What is HCPs' preference in terms of PR business delivery models?
- g) What is the HCPs' opinion on the availability and quality of PR services in India?

## CHAPTER II: REVIEW OF LITERATURE

### **2.1. Theoretical Framework**

Pulmonary rehabilitation (PR) represents a pivotal component of chronic respiratory disease management, providing structured multidisciplinary interventions aimed at improving client function, reducing symptom burden, and enhancing quality of life. In India, the role of PR has gained increasing attention, spurred by the growing prevalence of chronic respiratory conditions such as chronic obstructive pulmonary disease (COPD), asthma, and post-tuberculosis lung disease (P-TBLD) (Shenoy and Paul, 2023; Bhadra, 2021). Clinical guidelines now advocate PR as standard of care for these illnesses, recommending comprehensive programs that incorporate aerobic and resistance exercise, patient education, nutritional counseling, and psychosocial support to foster long-term disease self-management (Shenoy and Paul, 2023; Thakor *et al.*, 2025; Rashmi *et al.*, 2023).

Despite these recommendations and demonstrated effectiveness of PR in clinical studies, its integration into routine Indian healthcare faces notable challenges (Getzzg, 2025; Bhadra, 2021). A robust framework is essential for understanding the complex, multilevel barriers and enablers influencing PR referral, implementation, and customer adherence. Such a framework not only illuminates individual behaviors and knowledge gaps among healthcare professionals and clients, but also addresses systemic and contextual factors within hospitals, communities, and health policy environments.

### **2.2. Chronic Respiratory Disease and the Need for Rehabilitation**

India is home to a substantial burden of chronic respiratory disorders, which collectively account for a significant proportion of hospitalizations, lost productivity, and premature mortality. COPD prevalence approaches 8% in many urban and semi-urban

regions, while the lingering impact of pulmonary tuberculosis leaves large numbers of adults with ongoing respiratory dysfunction even after microbiological cure (Shenoy and Paul, 2023; Bhadra, 2021). These conditions present as breathlessness, fatigue, muscle weakness, exercise limitation, nutritional problems, and psychological distress - that often persist despite optimal medical treatment.

Pharmacologic therapies, while necessary, cannot restore lost muscle function, prevent progressive decline in exercise capacity, or comprehensively address the emotional and social challenges faced by patients. PR has demonstrated consistent benefits not only in improving physical activity and functional scores but also in reducing anxiety, depression, and healthcare utilization (Shenoy and Paul, 2023; Thakor *et al.*, 2025; Augustine *et al.*, 2021; Stavarache *et al.*, 2022). It is, therefore, seen as integral for a holistic approach to respiratory disease management.

The most frequently sorted pharmacologic therapies certainly have limitations in improving the person's functional capacity to optimally participate in daily life activities. On the contrary, Rehabilitation addresses a wholesome impact on the person's lifestyle including the emotional regulation and satisfaction in engaging in meaningful activities.

### **2.3. Barriers Within the Health System**

Healthcare system fragmentation is a significant factor limiting PR access in India. Both public and private providers often lack standardized referral protocols, dedicated funding streams, or coordinated processes to integrate PR into chronic respiratory disease pathways (Sinha *et al.*, 2025; Rashmi *et al.*, 2023). Facility limitations—including absence of dedicated PR space, insufficient equipment, and shortage of trained multidisciplinary staff—further exacerbate disparities in program availability, especially outside major cities (Getzzg, 2025; Sinha *et al.*, 2025).

Provider knowledge and training remain variable. Many clinicians, especially in crowded outpatient departments, do not refer eligible patients to PR, partly due to limited awareness of its benefits, lack of clarity about referral processes, or competing time demands (Shenoy and Paul, 2023; Getzzg, 2025).

The role of nurses, physiotherapists, and non-physician providers is often unclear, leading to bottlenecks in teams and reduced multidisciplinary engagement. There are numerous barriers in the Indian healthcare systems like limitations in infrastructure, availability of skilled manpower, poor awareness among the clinical fraternity for establishing referral pathways and role clarity. There is no focus on quality systems viz. standardized protocol/ clinical care pathway or quality improvement initiatives in the management of CRDs in private or public healthcare systems.

#### **2.4. Applying Behavioral and Health Systems Theory**

A comprehensive framework integrates behavioral models, systems thinking, and implementation science. Key domains that have been formally studied in Indian PR research include:

**Knowledge and Skills:** Studies show that targeted education for both providers and patients—delivered via group sessions, community outreach, or digital tools—strongly predicts referral rates and ongoing participation (Shenoy and Paul, 2023; Thakor *et al.*, 2025; Augustine *et al.*, 2021).

**Beliefs About Capabilities and Consequences:** Provider confidence, patient self-efficacy, and understanding of PR's impact are crucial enablers. Interventions focusing on group goal setting, motivational interviewing, and feedback have shown improvement in both referral and adherence (Getzzg, 2025; Bhadra *et al.*, 2021).

**Role Identity and Teamwork:** Redefining referral responsibilities, training peer leaders, and promoting multidisciplinary teams have addressed workforce gaps in peripheral settings. Nurse- and volunteer-led programs have demonstrated comparable efficacy to traditional hospital-based models (Getzgz, 2025; Thakor *et al.*, 2025).

**Environmental Context and Resources:** Peer-led, professionally assisted PR in rural settings has achieved high completion rates and functional improvement, suggesting adaptability of PR concepts even in low-literacy and resource-constrained communities (Shenoy and Paul, 2023; Getzgz, 2025).

**Social Influence and Support:** Family engagement and community support networks influence PR uptake and satisfaction. Non-family social reinforcement (group training, community health worker engagement) has doubled adherence rates in some trials (Getzgz, 2025; Thakor *et al.* 2025).

**System Integration, Referral Pathways, and Policy:** National strategies such as the National Programme for Prevention and Control of Non-Communicable Diseases (NPCDCS) now include PR within chronic disease management guidelines, but implementation at the state and local level remains sporadic. Evidence underscores the need for policy advocacy, expanded funding, and administrative reform to make PR a standard offering (Shenoy and Paul, 2023; Rashmi *et al.*, 2023).

Applying Behavioral and Health Systems Theory includes multifactorial scientific evidence for knowledge and skills, beliefs about capabilities and consequences, role clarity, teamwork, environmental resources, social influence and support as well as system integration for referral pathways and policies.

## **2.5. Continuing Challenges and Future Directions**

Despite successes, gaps remain in provider training, funding, outcome measurement, and person-centric program adaptation. Outcomes depend on sustained leadership engagement, ongoing staff education, integration of telehealth and digital support, and comprehensive policy support from national and regional authorities (Sinha, 2025; Rashmi *et al.*, 2023).

Ethical clinical practice emphasizes individualized PR plans, transparent communication, and culturally sensitive education, especially for vulnerable or marginalized communities. Multi-center trials, health systems research, and innovation-focused studies are ongoing to further optimize PR delivery in diverse Indian settings (Getzgz, 2025; Japi, 2025; Rashmi *et al.*, 2023; Bhadra *et al.* 2021).

Future directions involve scaling up nurse-and-peer-led models, incorporating PR into insurance and reimbursement frameworks, and leveraging technology for personalized support and adherence tracking. Research into customer motivation, family support, community engagement, and cost-effectiveness will continue to inform best practices.

## **2.6. Indian Empirical Evidence**

In the Indian respiratory care landscape, studies report that positive attitudes towards PR are fostered when clinicians have witnessed improvement in their patients' exercise tolerance, daily functioning, or psychological well-being following rehabilitation programs (Getzgz, 2025; Sinha *et al.*, 2025; Thakor *et al.*, 2025). Conversely, skepticism or perceived inconvenience—fueled by time constraints, lack of program availability, or assumptions about poor patient adherence—can deter referrals even among well-informed providers. The subjective norm component is evident in clinical settings where PR referral practices are either institutionally supported or undermined by lack of consensus, administrative apathy, or

peer indifference (Jebaraj *et al.*, 2025; Bhadra *et al.*, 2021).

Numerous multicenter studies and feasibility trials have examined how attitudes and subjective norms interact to influence PR referral and patient engagement in India (Getzzg, 2025; Jebaraj *et al.*, 2025; Sinha *et al.*, 2025; Thakor *et al.*, 2025). In an interventional study across five medical centers, providers with strong intention to refer were those who believed PR could yield meaningful, observable benefits for their patients and who worked in teams or settings where regular referrals were modeled, supported, or even incentivized (Sinha *et al.*, 2025). However, in hospitals where PR was irregular, underfunded, or marginalized within the larger respiratory care framework, referrals lagged and program enrollment rates diminished despite robust evidence for clinical benefit (Bhadra *et al.*, 2021; Thakor *et al.*, 2025).

Peer pressure and clinical leadership have repeatedly emerged as critical social norm influences. In both public and private sector settings, referral rates rose when respected clinicians openly advocated for PR, shared success stories, and normalized rehabilitation as part of the standard management protocol for COPD, asthma, and post-TB lung disease (Bhadra *et al.*, 2021; Thakor *et al.*, 2025). Conversely, in clinics where PR was dismissed as optional, staff education and customer engagement were invariably limited.

A marginal PR programs have shown success where care providers strongly believed in the efficacy after witnessing client improvements while many other factors like dropouts or irregular attendance fuel skepticism for active advocacy for PR in India.

## **2.7. Factors Shaping Attitudes and Norms**

Key influencing factors of attitudes include clinical exposure, training, and access to rehabilitation resources. Rural and peripheral centers face the additional challenge of limited

infrastructure, which shapes provider expectation and confidence about PR outcomes (Getzzg, 2025; Thakor *et al.*, 2025).

Structured workshops, collaborative case reviews, and regular data sharing on client improvements can meaningfully transform attitudes, aligning them with best available evidence.

## **2.8. Interventions and Innovations in PR service**

Behavioral interventions have demonstrated promising results. Tailored educational programs, peer mentoring, patient storytelling, and provider incentive schemes have all been used to shift attitudes and foster pro-referral norms (Getzzg, 2025; Jebaraj *et al.*, 2025; Thakor *et al.*, 2025). Clinics that implemented regular provider and family education sessions - potentially leveraging digital media and group workshops - reported increased willingness among both staff and customers to consider PR as a vital treatment component.

Integration into national guidelines and disease management strategies, as exemplified by the National Programme for Prevention and Control of Non-Communicable Diseases, further elevates PR from discretionary to expected practice (Jebaraj *et al.*, 2025; Getzzg, 2025).

These efforts solidify the idea that rehabilitation is not a luxury or last resort, but a routine, evidence-based part of chronic respiratory disease care.

## **2.9. The Population Challenge and Collective Context**

Over 30 million adults in India live with moderate to severe breathlessness, and hundreds of thousands suffer functional limitations due to advanced CRD. Rapid urbanization, rising rates of pollution, continued prevalence of indoor biomass fuel use, and

uneven tobacco control efforts all amplify risk (Getzzg, 2025; Japi, 2025).

India's burden of chronic respiratory diseases—COPD, asthma, post-tuberculosis lung disease, and interstitial lung disease—affects urban and rural populations alike, but with pronounced variation in risk exposures, healthcare accessibility, and support structures. Overall, India is on a high alert for CRDs due to multiple contributory factors like population surge, pollution, cultural contexts like tobacco/paan usage, biomass fuel, life style changes all of which multiplies the risk factor for the entire nation.

## **2.10. Health System Fragmentation and Institutional Barriers**

The Indian healthcare system is characterized by an intricate mix of public, private, and informal providers. This fragmentation leads to highly variable access—well-resourced urban facilities may achieve high referral rates, yet families in remote villages often receive little information or support regarding rehabilitation.

Resource availability further divides PR delivery. Comprehensive rehabilitation requires physical facilities, equipment, dedicated staff, routine monitoring, and funding. These components are unevenly distributed, limiting program scalability and sustainability in resource-constrained states and low-income districts (Japi, 2025; Thakor *et al.*, 2025).

Institutional priorities and hospital leadership directly impact whether PR is perceived as an essential service. Most facilities report challenges with staffing, funding, interdepartmental coordination, and maintaining quality standards in PR service provision.

India is a large country with fragmented healthcare systems and PR probably should be incorporated in the Primary Health Centres itself, since they provide greater access to most Indians residing in villages/Taluks.

## **2.11. Impact of Policy and Health System Reform**

Public policies and national health programs set the stage for large-scale PR adoption. The National Programme for Prevention and Control of Non-Communicable Diseases (NPCDCS) and similar state-level initiatives now formally recommend PR as part of chronic respiratory disease management. Yet, implementation remains inconsistent (Getzzg, 2025). Federal and state authorities increasingly prioritize funding for PR infrastructure, staff training, and outcome monitoring, striving to expand access beyond urban tertiary hospitals.

Health system reforms have focused on:

- Integrating PR into standard chronic disease bundles and referral pathways.
- Funding interdisciplinary teams and peer educator networks.
- Leveraging digital records, mobile health platforms, and telemedicine to reach remote villages.
- Supporting research on community engagement, cost-effectiveness, and person-centered best practices.

## 2.12. Summary

Pulmonary rehabilitation (PR) is an essential aspect of chronic respiratory disease (CRD) management for millions across India. This multidisciplinary, evidence-based intervention is recommended in major clinical guidelines for conditions such as Chronic Obstructive Pulmonary Disease, post-tuberculosis lung disease, asthma, and other CRDs. The scientific consensus is clear: PR improves exercise tolerance, reduces dyspnea and fatigue, elevates health-related quality of life, and reduces health care resource overuse for individuals with CRD (Jebaraj *et al.*, 2025; Getzzg, 2025; Sinha *et al.* 2025; Thakor *et al.*, 2025; Karande, Gosavi and Godse, 2024)

Despite these benefits, access to PR remains limited for India's vast population. Less than 2% of eligible CRD patients currently receive PR services. Systemic, professional, and customer-level barriers stand in the way of wider adoption. These include limited local facilities, lack of trained personnel, inadequate provider awareness and referral, financial strain, patient preference for pharmacological treatments over rehabilitation, weak family and social support, and misaligned health system incentives (Getzzg, 2025; Thakor *et al.*, 2025; Karande, Gosavi and Godse, 2024).

Clients in remote and economically deprived areas are especially disadvantaged, relying on private sector access or facing prohibitive out-of-pocket costs. Recent research and innovative program experiences indicate that community-based PR models—delivered through peripheral centres, trained local volunteers, nurse-led and student-led programs—are viable solutions for overcoming access and adherence challenges in low-resource settings (Jebaraj *et al.*, 2025; Thakor *et al.*, 2025). Peer-led models, integrated with skilled therapist oversight and structured community education, have resulted in participation rates comparable to urban, centre-based PR, with 70% of patients in feasibility studies completing 8-week programs. Significant gains in exercise capacity (as measured by six-minute walk

distance), daily activity scores, and patient satisfaction have been consistently reported (Getzzg, 2025; Sinha *et al.* 2025; Karande, Gosavi and Godse, 2024).

Ethical and practical considerations are central: education must reach families and caregivers, programs must adapt to local culture and economic reality, and continuous data collection is needed for monitoring and further innovation (Jebaraj *et al.*, 2025; Getzzg, 2025).

Importantly, multi-sector collaboration—linking hospitals, community health organizations, policy makers, and customers—will be needed for sustainable, resilient PR infrastructure nationwide.

Research continues into addressing the persistent barriers. Studies evaluate ways to increase provider knowledge, integrate PR into routine outpatient management, simplify referral pathways, and harness technology for outreach and adherence support. Findings so far are encouraging, suggesting that with targeted education and structural reform, India can make PR a reality for all who need it (Getzzg, 2025; Thakor *et al.*, 2025).

In conclusion, pulmonary rehabilitation is a clinically proven, cost-effective, and life-enhancing intervention for chronic respiratory disease in India. Establishing good referral centres of excellence and scaling up to increase the reach in all public and private hospitals could make PR accessible and available to the needy. Expansion of community-based and peer-led models, inclusion in policy frameworks, and commitment to providing education promise to transform care for millions of customers. The path forward will require partnership, research, and sustained investment—but the impact on individual and population health is likely to be profound and enduring.

CHAPTER III:  
METHODOLOGY

**3.1. Overview of the Research Problem**

Pulmonary rehabilitation (PR) is a well-established, evidence-based intervention for managing chronic respiratory conditions such as COPD. However, despite the benefits implementation of PR remains inconsistent. Health care professionals play a very important role in aiding PR. Understanding their perspectives is essential to identify barriers and opportunities for improving access to PR services. This study addresses the Knowledge-Aptitude-Practice gap by exploring the experiences, attitudes, and perceived challenges among HCPs regarding the delivery and institutional support of pulmonary rehabilitation. A Descriptive cross-sectional quantitative approach was selected to gain in-depth insights into the subjective views of multidisciplinary healthcare providers involved in PR.

The key research problem this survey-based research addresses is to understand the underlying factors which create the gap between the knowledge translation of evidenced pulmonary rehabilitation (PR) programs and their clinical implementation in India. The study aims to analyse the current process of referral and client participation by exploring the perspectives of healthcare professionals (HCPs). Specifically, it seeks to identify the factors that act as enablers and barriers to the referral process, with the goal of improving it by suggesting reform measures that can be utilized not by all countries regardless of their income and development status.

**3.2. Operationalization of Theoretical Constructs**

This study was based on **knowledge-aptitude-practice** framework. It includes perceived benefits of PR, referral behavior, familiarity on guidelines, perceived barriers, organizational constraint, demographics.

### **3.3. Research Purpose and Questions**

The purpose of this study is to explore perspectives of Healthcare Professionals (HCPs) in implementation and delivery of Pulmonary Rehabilitation business.

Research questions

- a) What is the awareness and attitude by HCPs towards Pulmonary Rehabilitation service?
- b) What are the beliefs of HCPs on the worth and benefits of Pulmonary Rehabilitation service?
- c) What are the enabling factors and challenges perceived by HCPs for referral to Pulmonary Rehabilitation service?
- d) HCPs' confidence and preparedness to refer clients for Pulmonary Rehabilitation service?
- e) What are the HCPs' recommended strategies and expected support to improve PR referral and participation to facilitate the business?
- f) What is HCPs' preference in terms of PR business delivery models?
- g) What is the HCPs' opinion on the availability and quality of PR service in India?

### **3.4. Research Design**

The Internal Scientific Research Committee (ISRC) and Institutional Ethics Committee (IEC) approved the study.

Informed consent obtained from all the participants. A quantitative, descriptive cross-sectional survey was used to explore perspectives of health care professionals (HCPs) on

pulmonary rehabilitation (PR). A cross-sectional approach from diverse healthcare professionals enables assessment of their perspectives. A questionnaire was used as primary tool for data collection which was developed based on similar studies and adapted to Indian context and **vettted through Subject matter experts from the field of Respiratory Medicine and Physiatry** (Questions courtesy - Aldhahir *et al.*, 2022; Katagira *et al.*, 2021). The Institutional Scientific Research Committee (ISRC) thoroughly scrutinized the survey questionnaire for its appropriateness for justifying the study objectives and approved after incorporating their recommendations.

### **3.5. Population and Sample**

Convenience sampling techniques were used to recruit the study participants. This sampling methodology is used, keeping in mind the busy work life of real-world professionals which makes it difficult to accurately predict the number of responses. Sample size calculation is not required, as this would be an exploratory study design. HCPs who are working in India and have opportunities to care for CRD clients were targeted. Participants were recruited from a range of clinical settings to ensure diversity in profession, age, and gender.

Total 265 respondents and 33 Participants who select multiple conflicting options and contradictory statements were excluded. A total of 232 Indian Healthcare professionals' responses as per criteria were analyzed, which includes Physiotherapist (n=148), Physiatrists (n=22), Pulmonologist (n=12), Occupational therapist (n= 15), general physicians, internal medicine specialists, nurses, cardiologists, psychologists, nutritionist, rheumatologist, yoga therapists, surgeons all of whom care for CRD clients. Sample comprised of 116 (50%) male and 116 female (50%).

Conceptual alignment, methodological rigour, and systematic data screening—all suitable for an exploratory, descriptive cross-sectional design—were used in the current study to guarantee sample validity. Strong construct validity between the study questions and the sampled respondents was ensured by precisely defining the target group as healthcare professionals (HCPs) actively involved in the care of clients with chronic respiratory diseases (CRDs) in India. The study reduced the possibility of adding respondents without pertinent experiential knowledge of pulmonary rehabilitation (PR) by limiting participation to specialists with practical exposure to CRD care.

Convenience sampling was used; however, measures were taken to improve representational breadth and external validity. Numerous national professional platforms, such as cross-sector professional networks and discipline-specific associations (such as physiotherapy, pulmonary medicine, and rehabilitation medicine), were used for recruitment. By enabling involvement from a variety of geographic areas, therapeutic settings (public and private), and professional positions, this multi-channel recruiting technique strengthened ecological validity by reducing over-representation from a single institution, region, or speciality.

Sample validity was further reinforced by multidisciplinary participation. Physiotherapists, psychiatrists, pulmonologists, occupational therapists, doctors, nurses, psychologists, dietitians, and healthcare administrators made up the final analysed cohort (n = 232). Because PR delivery and referral pathways are intrinsically multidisciplinary, this heterogeneity ensures that the results reflect a wide range of perspectives pertinent to PR implementation rather than a single-profession viewpoint.

Responses were subjected to stringent quality screening before analysis to improve internal validity and data integrity. Based on predetermined exclusion criteria - specifically, the selection of comments that were logically illogical or mutually contradictory - 33 entries

were eliminated. By ensuring that only dependable and internally consistent replies were included in the final dataset, this step reduced response noise and measurement error.

Sample validity was further enhanced by instrument validity. Following expert vetting by pulmonary medicine and psychiatry professionals, the questionnaire was modified from previously published studies and contextualised for the Indian healthcare setting. The Institutional Scientific Research Committee's (ISRC) approval reduced concept under-representation or ambiguity by ensuring that survey items were pertinent, suitable, and in line with study objectives.

This method is in line with the exploratory nature of the study, which sought to find patterns, impressions, and relationships rather than precisely estimate population parameters, even though a formal sample size calculation was not carried out. Inferential analyses, such as logistic regression, binomial testing, and Chi-square correlations, were supported by the final sample size, which was appropriate to show stable descriptive trends and provide sufficient statistical power to identify significant relationships.

Lastly, procedural protections including informed permission, anonymity, and voluntary involvement supported the validity of the data gathered by reducing response bias and social desirability. The intentional focus on professional relevance, multidisciplinary diversity, and response validity guarantees that the sample offers a reliable and methodologically sound representation of Indian HCP perspectives on pulmonary rehabilitation, even though the authors acknowledge that convenience sampling and online recruitment may limit full national generalisability.

### **3.6. Participant Selection**

Healthcare professionals connected with care of CRD clients were the targeted population. The potential clinical fraternity included Physiotherapist, Psychiatrists, Pulmonologists, Occupational therapists, General physicians, Internal Medicine specialists, Nurses, Cardiologists, Psychologists, Clinical Nutritionists, Rheumatologists, Dermatologists, Surgeons etc. Other stakeholders like Hospital Operations Manager, Quality and Patient Safety Managers, Rehabilitation Managers etc. were also included since their perspective is important to understand their opinion on implementing and managing good quality PR programmes. This heterogenous mix of professionals ensures diverse perceptions on PR.

Inclusion criteria: HCPs who are working in India and have opportunities to care for CRD clients

Exclusion criteria: Around 33 respondents who have selected multiple conflicting options, and contradictory statements have been excluded.

### **3.7. Instrumentation**

A survey questionnaire was used. It includes personal details (demographics) of participants, and the survey includes questions on perspectives, referrals to PR, barriers to referral, and implementational format based on 5-point Likert scale.

### **3.8. Data Collection Procedure**

Survey questionnaire was converted as a Google Form and distributed to HCPs working in public and private health facilities across India. Survey link was forwarded

through professional WhatsApp groups, and other social networks like LinkedIn and Facebook. Also, we reached out to HCPs who are part of related professional bodies such as Indian Association of Physical Medicine and Rehabilitation (IAPMR), Indian Chest Society (ICS), Indian Association of Physiotherapists (IAP), All India Occupational Therapy Association (AIOTA), Consortium of Accredited Healthcare Organizations (CAHO) to distribute the survey to reach a greater number of HCPs working in India.

### **3.9. Data Analysis**

It was done using 5-point Likert scale (strongly agree to strongly disagree)

Distribution of responses (knowledge, attitudes, beliefs, and referral practices) were presented using tables.

A binomial test was used. It is suitable for analyzing categorical data expressed in proportions and helps identify differences beyond random chance.

Statistical analysis was done using Statistical Package for Social Sciences (SPSS) software.

Descriptive statistics were used to summarise various demographic factors of the participants and study key measures which included beliefs, barriers and attitude towards referring customers for pulmonary rehabilitation.

A binomial logistic regression analysis conducted to identify independent factors which have association with PR referral status.

Additionally, Chi square tests of independence used to derive associations between categorical variables such as age group, gender and profession with PR referral status.

A p-value of  $<0.05$  considered statistically significant for all analyses

### **3.10. Research Design Limitations**

Recall Bias and Non-Response Bias: The survey-based study design depends on HCPs self-reported data which might have potential nonresponse bias. Social responsibility bias is possible as some respondents might have opted to choose socially favourable answers rather than a totally honest opinion based on the ground reality. To some extent, the 360degree of comprehensive topic coverage approved by the subject matter experts could encourage respondents to share honest viewpoints compared to a short survey which has close ended questions. Recall bias is also possible since this survey deep dives into multiple aspects that cover personal experiences over a period. To mitigate potential response bias, the study opted for guaranteed anonymity ensuring that the captured data is quite an honest reflective of the participant's real-world experience.

The subject recruitment conducted via online platforms and professional forums which may have a selection bias towards those with digital mastery and accessibility. However, this method provided access to a diverse geographic representation that would be impossible through traditional physical distribution and collection of survey responses in person.

It is challenging to reach and engage a variety of professional organizations, including occupational therapists, psychologists, and dietitians. In a similar vein, getting busy doctors to actively participate is challenging and limit the total number of responses. Furthermore, even though this input offers ideas from a variety of professional settings and geographical locations, it is practically difficult to obtain comments from physicians practicing in various Indian states.

Though the sample size is lesser, it provides satisfactory statistical power to identify key tendencies. While this may a little bit affect generalizability, the deepness of data collected provides a foundational understanding that can influence expansive future studies.

### 3.11. Ethical Consideration

The protocol was submitted to the Institutional Scientific Research Committee and further to Institutional Ethics Committee (IEC) for approval, and the study was conducted only after the respective committee's approval.

Confidentiality of the data collected was assured to the participants and questionnaire and tests were administered only after the informed consent obtained. All participant data were stored securely and not used for any purpose other than academia and research.

Informed consent was obtained from all the participants. They were informed that participation in the study was entirely voluntary and also about their right to refuse to participate.

### 3.12. Conclusion

This study examined the **Knowledge-Aptitude-Practice (KAP) gap** concerning pulmonary rehabilitation (PR) among Indian healthcare professionals (HCPs) using a descriptive cross-sectional quantitative approach. Finding systemic obstacles and facilitators affecting the application of evidence-based PR standards in clinical practice across various socioeconomic circumstances was the main goal. Data were collected using a validated survey instrument modified for the Indian clinical environment after approval from the Institutional Ethics Committee (IEC) and the Internal Scientific Research Committee (ISRC). Convenience sampling produced a varied cohort of N=232 participants with an even gender distribution of 50% male and 50% female. The multidisciplinary mix included physiotherapists (n=148), psychiatrists (n=22), pulmonologists (n=12), occupational therapists (n=15), and other stakeholders involved in the management of chronic respiratory diseases.

A 5-point Likert scale was used to operationalize the survey, which evaluated PR awareness and attitudes, referral confidence, perceived clinical utility, preferred delivery models, and organizational limitations. Data was gathered digitally using Google Forms and distributed via national organizations including the Indian Association of Physiotherapists and the Indian Chest Society, as well as professional networks. SPSS was used for quantitative analysis. The framework for analysis comprised descriptive statistics for characterizing trends and demographics, binomial logistic regression to identify independent factors of PR referral status, and Chi-square tests to investigate relationships between referral behaviors and categorical factors such as age and profession. The threshold for significance was established at  $p < 0.05$ . Finally, the study recognizes that self-reported online surveys may contain selection and memory biases. Challenges in engaging certain medical subspecialties and the use of convenience sampling may limit the generalizability of the findings; however, the results provide a foundational baseline for addressing PR implementation gaps in India.

CHAPTER IV:  
RESULTS

**4.1. Overview of Key Findings**

265 healthcare professionals took part in the survey for this study, offering a variety of viewpoints on pulmonary rehabilitation (PR) in Chronic Respiratory Disease (CRD). Around 33 respondents who have selected multiple conflicting options, and contradictory statements have been excluded.

The participants' professional and demographic makeup offered important insights into how various health disciplines view PR's worth, how likely they are to recommend customers to such programs, and how they believe the expected results will be. A thorough presentation of the findings is given in the section that follows, which also includes preferences for delivery models and detailed descriptions of the demographic traits, professional backgrounds, years of experience, referral behaviors, and particular PR beliefs. Using placeholders to indicate the pertinent tables and figures in the dataset, the results are presented narratively

*Table 2 Gender wise distribution*

Variable	Level	Counts	Total	Proportion	p
Gender	Female	116	232	0.500	1.000
	Male	116	232	0.500	1.000

*Note.* Proportions tested against value: 0.5.

With precisely half of the participants being male (n = 116; 50%) and the other half being female (n = 116; 50%), the gender distribution of the respondents showed perfect symmetry. In surveys pertaining to healthcare, which frequently skew more toward either male or female respondents depending on the specialty involved, this equal representation is comparatively uncommon. The distribution did not significantly deviate from an equal split, according to the results of a binomial test. At the 0.05 level, the difference was not

statistically significant. Because it removes gender as a potential confounding factor in influencing general attitudes toward PR, this equal distribution is significant. In other words, there is more assurance that the results represent professional viewpoints rather than being distorted by gender imbalance because both sexes were equally represented.

*Table 3 Profession wise distribution*

Variable	Level	Counts	Total	Proportion	p
	Administrator	2	232	0.008	< .001
	Anaesthesiologist	1	232	0.013	< .001
	Cardiologist	3	232	0.013	< .001
	Clinical Nutritionist	2	232	0.008	< .001
	Clinical psychologist	1	232	0.004	< .001
	Dermatologist	1	232	0.004	< .001
	ER Doctor	1	232	0.004	< .001
	ENT doctor	1	232	0.004	< .001
	Gastroenterologist	1	232	0.004	< .001
Profession	General Physician	3	232	0.013	< .001
	Hand Surgeon	1	232	0.004	< .001
	Intensivist	1	232	0.004	< .001
	Internal Medicine	5	232	0.022	< .001
	Neuropsychologist	1	232	0.004	< .001
	Neurosurgeon	2	232	0.009	< .001
	Nurse	2	232	0.009	< .001
	Occupational Therapist	15	232	0.064	< .001
	Physiatrist	22	232	0.095	< .001
	Physiotherapist	148	232	0.638	< .001

Variable	Level	Counts	Total	Proportion	p
	Plastic surgeon	1	232	0.004	< .001
	Pulmonologist	12	232	0.052	< .001
	Quality Control and Quality Assurance officer	2	232	0.008	< .001
	Rheumatologist	1	232	0.004	< .001
	Yoga therapist	1	232	0.004	< .001

*Note.* Proportions tested against value: 0.5.

The results of the analysis of the respondents' professional distribution showed that physiotherapists made up the majority of the sample. Physiotherapists were by far the most represented profession among the 232 participants, with 148 (63.8%) working in this field. Given their crucial role in rehabilitation services, this overwhelming proportion implies that physiotherapists are the group most involved in PR as a discipline. With 22 participants (9.5%), psychiatrists were the next most prevalent professional group, followed by pulmonologists (12 participants, 5.2%). Occupational therapists (n = 11; 4.7%), internal medicine specialists (n = 5; 2.2%), cardiologists (n = 3; 1.3%), and general physicians (n = 3; 1.3%) were among the professions with significantly lower representation. Although they each accounted for less than two participants on average, a wide range of other specialties, including neurosurgeons, nurses, dermatologists, nutritionists, anesthesiologists, and even yoga therapists, contributed to the sample. The professional representation was statistically significant at  $p < 0.05$ , according to a binomial test, with physiotherapists predominating the sample in comparison to other groups. Although the presence of several disciplines, albeit in smaller numbers, emphasizes the multidisciplinary character of PR, physiotherapists' predominance is indicative of their long-standing position as the main suppliers of PR services.

Table 4 Distribution based on years of experience

Variable	Level	Counts	Total	Proportion	p
Years range	0-5	68	232	0.293	< .001
	5-10	39	232	0.168	< .001
	10-15	60	232	0.259	< .001
	15-20	26	232	0.112	< .001
	20-25	26	232	0.112	< .001
	25-30	5	232	0.022	< .001
	30-35	6	232	0.026	< .001
	40-45	1	232	0.004	< .001
	55-60	1	232	0.004	< .001

*Note.* Proportions tested against value: 0.5.

Although there was a tendency toward early- and mid-career professionals, the respondents' years of professional experience showed a wide distribution. Those with 0–5 years of experience made up the largest group (n = 68; 29.3%), followed by those with 10–15 years (n = 60; 25.9%). The next significant group consisted of professionals with 5–10 years of experience (n = 39; 16.8%), followed by those with 15–20 years and 20–25 years of experience (n = 26). Few respondents had more than 25 years of professional experience: 2.2% had 25–30 years, 2.6% had 30–35 years, and less than 1% had 40–45 or 55–60 years. These distributions were statistically significant at  $p < 0.05$ , according to the statistical analysis. This result suggests that professionals in the early and mid-stages of their careers are the study's primary representative group. This could have significant ramifications because younger professionals might be more receptive to cutting-edge models like tele-rehabilitation, whereas more senior professionals might have more clinical experience but make up a smaller percentage of the respondents.

Table 5 Referral based on profession

Profession	Belief on referral					Total
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Administrator	0	0	0	0	2	2
Anaesthesiologist	0	0	0	0	3	3
Cardiologist	1	0	0	0	2	3
Clinical Nutritionist	0	0	0	2	0	2
Clinical psychologist	0	0	1	0	0	1
Dermatologist	0	0	0	0	1	1
ENT doctor	0	0	0	0	1	1
Gastroenterologist	0	0	0	0	1	1
General Physician	0	0	0	2	1	3
Hand Surgeon	0	0	0	0	1	1
Intensivist	1	0	0	1	0	2
Internal Medicine	0	0	0	0	5	5
Neuropsychologist	0	0	0	0	1	1
Neurosurgeon	0	0	0	1	1	2
Nurse	0	0	0	0	2	2
Occupational Therapist	1	1	0	6	7	15
Physiatrist	1	0	0	6	15	22
Physiotherapist	12	0	5	32	99	148
Plastic surgeon	0	0	0	0	1	1
Pulmonologist	0	0	1	1	10	12
Quality Control and Quality Assurance officer	0	0	0	0	1	1
Rehab Manager	0	0	0	0	1	1
Rheumatologist	0	0	0	0	1	1
Yoga therapist	0	0	0	0	1	1
Total	16	1	7	51	157	232

Note. Each cell displays the observed counts

When referral practices were examined by profession, significant trends emerged regarding the groups most likely to support PR. Physiotherapists, physiatrists, and pulmonologists were the most vocal supporters of PR referral, according to the contingency

table analysis. Important patterns about the groups most likely to support PR were found when referral practices were analyzed by profession. The contingency table analysis showed that pulmonologists, physiotherapists, and physiatrists were the most outspoken advocates of PR referral. Only a small percentage of physiotherapists disagreed (n = 12) or were neutral (n = 5), with 32 agreeing and 99 strongly agreeing that they would refer clients to PR. Physiatrists (15 strongly agreeing and 6 agreeing) and pulmonologists (10 strongly agreeing and 1 agreeing) also demonstrated strong support. It's interesting to note that the general sentiment was to support PR even from less closely related professions like nutrition, yoga therapy, and dermatology. Overall, the data show that PR referrals are strongly supported by all professions, with the strongest support coming from specialties that are focused on respiratory and rehabilitation.

#### 4.2. Q No-1 Opinions and believes about Pulmonary Rehabilitation

*Table 6 Frequencies for [I believe PR is worthwhile in CRD]*

<b>[I believe PR is worthwhile in CRD]</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>Strongly disagree</b>	14	6.0%	6.0%
<b>Neutral</b>	9	3.9%	9.9%
<b>Agree</b>	61	26.3%	36.2%
<b>Strongly agree</b>	148	63.8%	100.0%

Perceptions of PR's usefulness in CRD management were investigated from a number of angles, and the results show a consistently high level of support for PR's effectiveness. Most respondents had positive opinions when asked if PR is beneficial in the context of CRD. In particular, 25.0% agreed and 62.1% strongly agreed, showing that almost 90% of professionals thought PR was essentially beneficial. A small percentage of respondents gave neutral or mixed answers, while just 6.5% strongly disagreed. Professionals strongly agreed on the value of PR in managing CRD, as evidenced by the statistically significant difference

in response distribution at the 0.05 level.

*Table 7 Frequencies for [I believe that PR would be beneficial in reducing dyspnea & fatigue.]*

<b>[I believe that PR would be beneficial in reducing dyspnea &amp; fatigue.]</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>Disagree</b>	2	0.9%	0.9%
<b>Neutral</b>	8	3.4%	4.3%
<b>Agree</b>	64	27.6%	31.9%
<b>Strongly agree</b>	144	62.1%	94.0%
<b>Strongly disagree</b>	14	6.0%	100.0%

PR was also seen favorably as a way to lessen fatigue and dyspnea. Nearly 90% of participants supported PR's ability to effectively reduce these symptoms, with over 61% strongly agreeing and another 27% agreeing. The overwhelming evidence supporting this claim highlights PR's function as a key symptom management intervention, as fatigue and dyspnea are the most prevalent and incapacitating symptoms of CRD. The support for PR for reducing fatigue and dyspnea was not a coincidence, as the binomial analysis verified statistical significance at  $p < 0.05$ .

*Table 8 Frequencies for [I believe that PR will improve client anxiety and depression]*

<b>[I believe that PR will improve patient anxiety and depression]</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>Disagree</b>	7	3.0%	3.0%
<b>Neutral</b>	17	7.3%	10.3%
<b>Agree</b>	85	36.6%	47.0%
<b>Strongly agree</b>	113	48.7%	95.7%
<b>Strongly disagree</b>	10	4.3%	100.0%

Participants recognized the psychological advantages of PR in addition to its ability to control physical symptoms. Just 3% disagreed with the statement that PR helps CRD clients with their anxiety and depression, while 48.3% strongly agreed and 34.9% agreed. The fact

that over 80% of respondents agreed with this statement highlights PR's acceptance as a comprehensive intervention that addresses psychological well-being in addition to physical rehabilitation. The strength of the observed distribution was reinforced by statistical testing, which showed that the differences were significant at  $p < 0.05$ .

*Table 9 Frequencies for [I believe that PR will improve health-related quality of life.]*

<b>[I believe that PR will improve health-related quality of life.]</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>Disagree</b>	2	0.9%	0.9%
<b>Neutral</b>	7	3.0%	3.9%
<b>Agree</b>	63	27.2%	31.0%
<b>Strongly agree</b>	147	63.4%	94.4%
<b>Strongly disagree</b>	13	5.6%	100.0%

PR was thought to have an equally significant effect on HRQoL, or health-related quality of life. Less than 10% said they were neutral or disagreed, while 62.1% strongly agreed and 27.2% agreed that PR enhances HRQoL. PR is widely considered to be transformative in terms of overall quality of life, integrating improvements in physical functioning, symptom burden, and psychosocial outcomes. These findings were statistically significant at the 0.05 level.

*Table 10 Frequencies for [I think that PR will reduce the risk of CRD exacerbation]*

<b>[I think that PR will reduce the risk of CRD exacerbation]</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>Disagree</b>	6	2.6%	2.6%
<b>Neutral</b>	21	9.1%	11.6%
<b>Agree</b>	88	37.9%	49.6%
<b>Strongly agree</b>	105	45.3%	94.8%
<b>Strongly disagree</b>	12	5.2%	100.0%

It was also generally acknowledged that PR could lower the risk of exacerbations in clients with CRD. Over 83% of participants supported this outcome, with about 45.3% strongly agreeing and 37.9% agreeing. 8.2% were neutral, and only 2.6% disagreed. The fact that PR is viewed as both a preventative and a rehabilitative intervention, lowering the risk of acute exacerbations—a significant contributor to morbidity and healthcare utilization in CRD—was highlighted by the statistical significance attained at  $p < 0.05$ .

*Table 11 Frequencies for [I believe that PR will improve patient nutritional status]*

<b>[I believe that PR will improve patient nutritional status]</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>Disagree</b>	11	4.7%	4.7%
<b>Neutral</b>	61	26.3%	31.0%
<b>Agree</b>	79	34.1%	65.1%
<b>Strongly agree</b>	73	31.5%	96.6%
<b>Strongly disagree</b>	8	3.4%	100.0%

Responses were more diverse when the question of how PR affects nutritional status was posed. A sizable 23.3% were neutral, despite the fact that 35.3% agreed and 30.6% strongly agreed, indicating that roughly two-thirds thought it was beneficial. A tiny minority said they were unsure, and another 3.9% disagreed. Perceptions of nutritional benefits were not randomly distributed, even though consensus was weaker, as this distribution was statistically significant at the 0.05 level even though it was less definitive than for other outcomes.

Table 12 Frequencies for [I believe that PR will improve patient disease self-management]

[I believe that PR will improve patient disease self-management]	Counts	% of Total	Cumulative %
<b>Disagree</b>	10	4.3%	4.3%
<b>Neutral</b>	27	11.6%	15.9%
<b>Agree</b>	81	34.9%	50.9%
<b>Strongly agree</b>	102	44.0%	94.8%
<b>Strongly disagree</b>	12	5.2%	100.0%

There was greater support for the idea that PR helps clients manage their illnesses on their own. Nearly 80% of respondents agreed in this domain, with 44.0% strongly agreeing and 35.3% agreeing. 5.6% disagreed, 5.6% strongly disagreed, and 10.8% were neutral. These findings, which were statistically significant at  $p < 0.05$ , indicate that while a small but significant percentage of professionals are still dubious, many professionals think PR gives clients more control over how they manage their conditions.

Table 13 Frequencies for [I believe PR would improve CRD related health literacy]

[I believe PR would improve CRD related health literacy]	Counts	% of Total	Cumulative %
<b>Disagree</b>	4	1.7%	1.7%
<b>Neutral</b>	29	12.5%	14.2%
<b>Agree</b>	82	35.3%	49.6%
<b>Strongly agree</b>	104	44.8%	94.4%
<b>Strongly disagree</b>	13	5.6%	100.0%

Positive opinions were also expressed regarding PR's influence on health literacy related to CRD. More than three-quarters of participants supported PR's educational role, with nearly 44% strongly agreeing and 35.8% agreeing that PR improves health literacy. 12.1% were neutral, and only a small percentage (6.0% strongly disagreed and 1.3% disagreed) voiced doubts. These results, which were statistically significant at  $p < 0.05$ ,

demonstrated the value of PR as a tool for client education in addition to physical rehabilitation.

*Table 14 Frequencies for [I believe PR will reduce the CRD related cost for healthcare utilization in India]*

<b>[I believe PR will reduce the CRD related cost for healthcare utilization in India]</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>Disagree</b>	7	3.0%	3.0%
<b>Neutral</b>	27	11.6%	14.7%
<b>Agree</b>	80	34.5%	49.1%
<b>Strongly agree</b>	105	45.3%	94.4%
<b>Strongly disagree</b>	13	5.6%	100.0%

Answers to the question of whether PR could lower healthcare utilization costs in India were generally positive, albeit a little more erratic than in other areas. 34.9% agreed and 44.4% strongly agreed, compared to 10.3% who were neutral and 5.6% who disagreed or strongly disagreed. Although there was some professional skepticism, statistical testing confirmed significance at  $p < 0.05$ , indicating that the distribution of opinions was meaningful and that the majority of participants thought PR was cost-saving.

*Table 15 Binomial Test*

<b>Variable</b>	<b>Level</b>	<b>Counts</b>	<b>Total</b>	<b>Proportion</b>	<b>p</b>
Do you have any recommendations on how best to deliver a PR program for CRD patients?	Hospital based supervised PR sessions followed by maintenance program	149	232	0.642	< .001
	PR as home care with therapist visit patient home	37	232	0.159	< .001
	Remotely supervised Virtual rehabilitation sessions (Tele rehabilitation)	19	232	0.082	< .001

Variable	Level	Counts	Total	Proportion	p
	Self exercises at home using an exercise manual	27	232	0.116	< .001

*Note.* Proportions tested against value: 0.5.

In terms of delivery models for PR, respondents were asked to select their preferred approach. 64.2% of respondents preferred hospital-based supervised PR sessions that were followed by maintenance plans. This strong preference was statistically significant at  $p < 0.05$ , suggesting that professionals value well-planned, closely watched interventions that guarantee adherence and offer thorough customer engagement.

The second most popular option, supported by 15.9% of participants, was home-based care with therapist visits. This indicates that clients who are unable to attend hospital sessions need more accessible, community-centered models.

8.2% of respondents selected tele-rehabilitation, which entails remotely supervised virtual rehabilitation, indicating a limited but increasing receptivity to innovations in digital health.

Although professionals obviously prefer supervised settings, 11.6% of respondents supported self-directed exercise at home using an exercise manual, suggesting some interest in low-cost, person-driven approaches. At the 0.05 level, every preference was statistically significant.

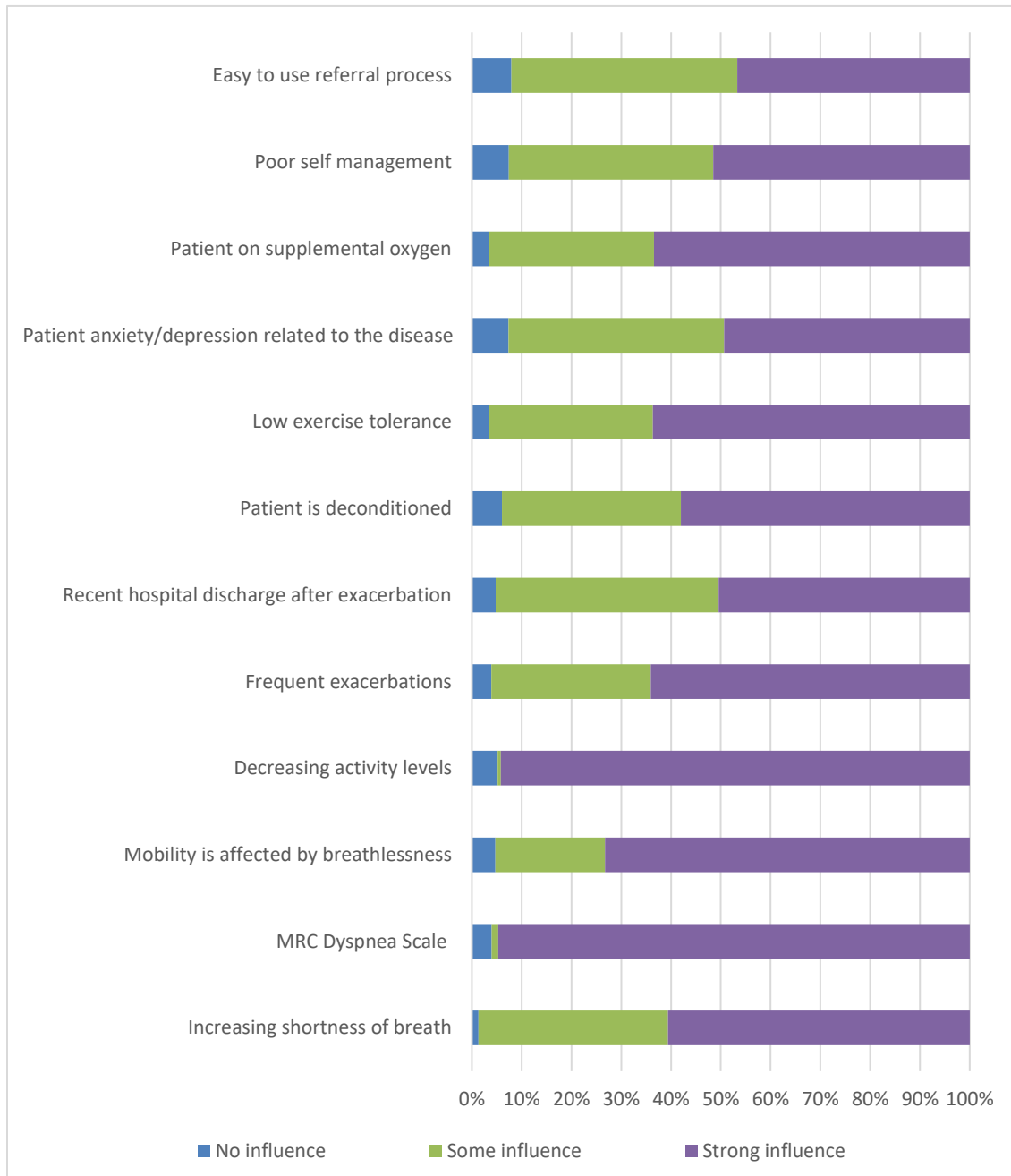
**4.3. Q No-2; I feel sure that I understand the eligibility criteria for pulmonary rehabilitation.**

*Table 16 Frequencies of - I feel sure that I understand the eligibility criteria for pulmonary rehabilitation*

<b>I feel sure that I understand the eligibility criteria for pulmonary rehabilitation</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>0</b>	2	0.9%	0.9%
<b>1</b>	2	0.9%	1.7%
<b>3</b>	1	0.4%	2.2%
<b>4</b>	3	1.3%	3.4%
<b>5</b>	16	6.9%	10.3%
<b>6</b>	18	7.8%	18.1%
<b>7</b>	20	8.6%	26.7%
<b>8</b>	42	18.1%	44.8%
<b>9</b>	30	12.9%	57.8%
<b>10</b>	98	42.2%	100.0%

Participants showed high levels of self-reported confidence in their comprehension of the requirements for eligibility for pulmonary rehabilitation (PR). Healthcare professionals (HCPs) assessed their understanding at the top end of the spectrum on a scale of 0 to 10, with 42.2% (n=98) giving a maximum score of 10. In total, 73.2% of the cohort (n=170) received an 8 or higher for comprehension. On the other hand, just 3.4% (n=8) of respondents rated their comprehension at a 4 or lower, indicating a modest perceived knowledge deficit.

**4.4. Q No-03; Opinion on factors might influence decision to refer CRD patients to a PR programme?**



*Figure 8 Factors which might influence decision to refer CRD patients to a PR programme*

**Factors Affecting Pulmonary Rehabilitation Referrals:** Clinical symptoms and objective functional impairment are the main reasons for PR referrals, according to an analysis of healthcare professionals' (HCPs') viewpoints. Clinical decision-making was most significantly impacted by factors pertaining to physical disability and disease severity:

**Primary Clinical Drivers:** More than 90% of HCPs cited "Decreasing activity levels," "MRC Dyspnea Scale" scores, and "Mobility affected by breathlessness" as having a "Strong Influence" as the most effective catalysts for referral.

**Acute and Symptomatic Indicators:** "Increasing shortness of breath," "Frequent exacerbations," "Low exercise tolerance," and "Patient on supplemental oxygen" also had a significant impact; at least 60% of respondents classified these as "Strong Influence" factors.

**Psychosocial and Systemic Factors:** Although still important, systemic facilitators like "Easy to use referral process" and psychosocial components like "Patient anxiety/depression" demonstrated a more balanced distribution between "Strong" and "Some" influence, with each being cited as a "Strong Influence" by about half of the cohort.

**Minimal Impact Factors:** The "No influence" response was consistently low (usually less than 10%) across all survey categories, indicating that HCPs view PR referrals through a multifaceted lens in which almost all clinical and functional indicators are deemed relevant to the decision-making process.

**4.5. Q No-04; Opinion on factors that might influence decision not to refer an eligible clients to PR?**

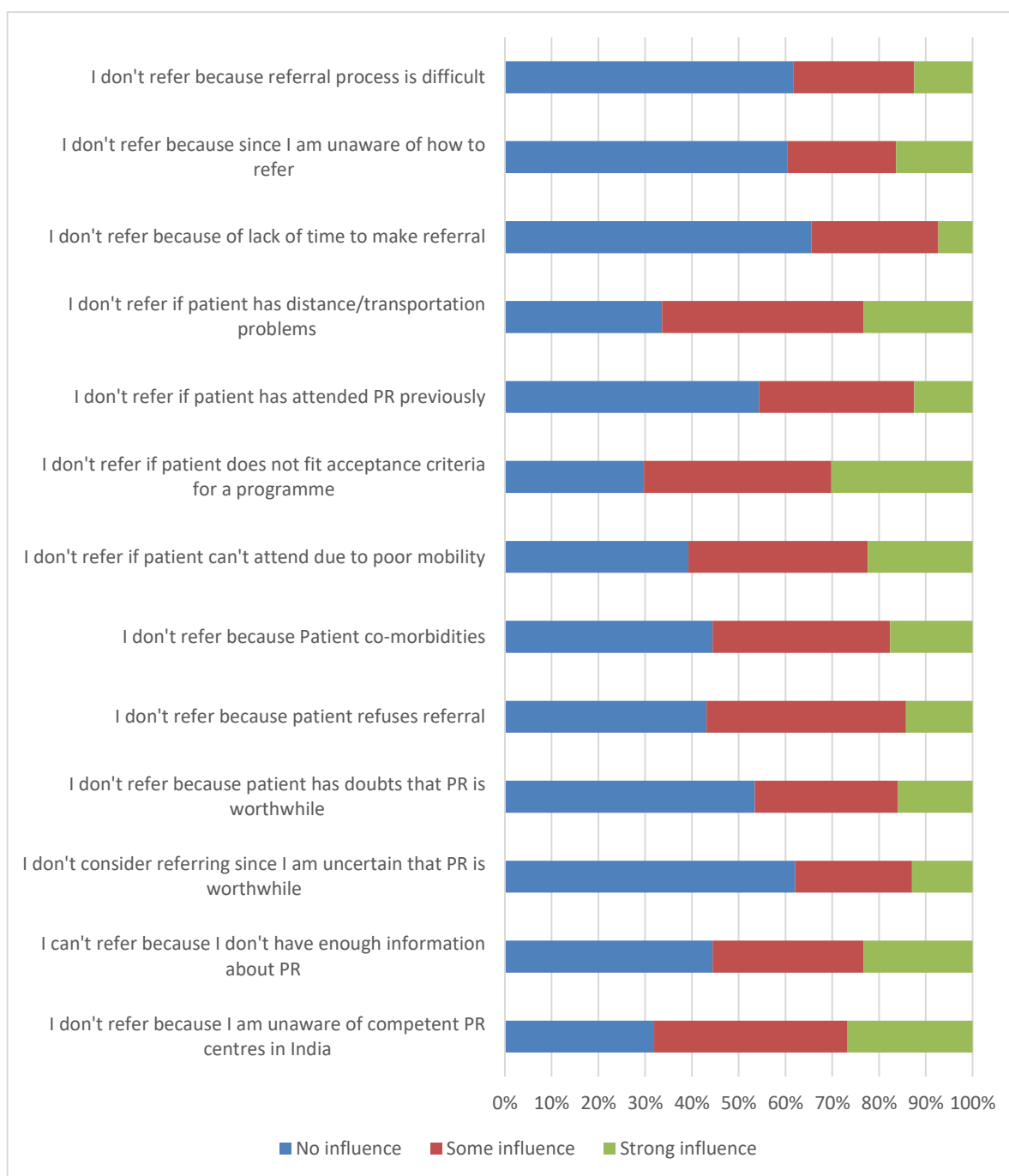


Figure 9 Factors which might influence the decision not to refer an eligible patient to PR

**Clinical Motivators and Enablers for Referrals:** The main triggers for clinical referral, according to healthcare professionals (HCPs), are objective functional impairment and symptomatic progression.

Functional Decline: More than 90% of respondents stated that indicators of functional status, particularly "Decreasing activity levels," "MRC Dyspnea Scale" scores, and "Mobility affected by breathlessness," had a significant impact on their decision to refer.

Symptomatic Burden: More than 60% of HCPs said that clinical indicators such "frequent exacerbations," "patient on supplemental oxygen," and "low exercise tolerance" had a major impact on referral patterns.

Systemic Enablers: Approximately 45% of the cohort cited structural facilitators such a "Easy to use referral process" as a strong influence, underscoring the significance of streamlined institutional pathways, even while psychological factors like "Patient anxiety/depression" were substantial.

**Perceived Obstacles and Disincentives for Referrals:** According to the findings, provider-level skepticism is less of a barrier to PR utilization than logistical difficulties and customer-related issues.

Logistical and Access Barriers: The main obstacles were not related to the clinician's worldview. The majority of participants indicated "Distance/transportation problems," "Customer refusal," and "Unawareness of competent PR centers in India" as having some or strong influence on non-referral.

Clinician-Level Constraints: At least 60% of respondents said that internal obstacles, such as "Lack of time to make referral" and "Unaware of how to refer," had no effect. This implies that although HCPs are typically willing to refer, infrastructure and client-specific constraints prevent them from doing so.

Perceived Utility: Over 60% of HCPs said that confusion about whether "PR is worthwhile" had no bearing on their choice not to refer, demonstrating a high degree of professional trust in the intervention's value. Provider skepticism over the effectiveness of PR was a negligible issue.

**4.6. Q No-05; Opinion about PR that best suits the personal experience**

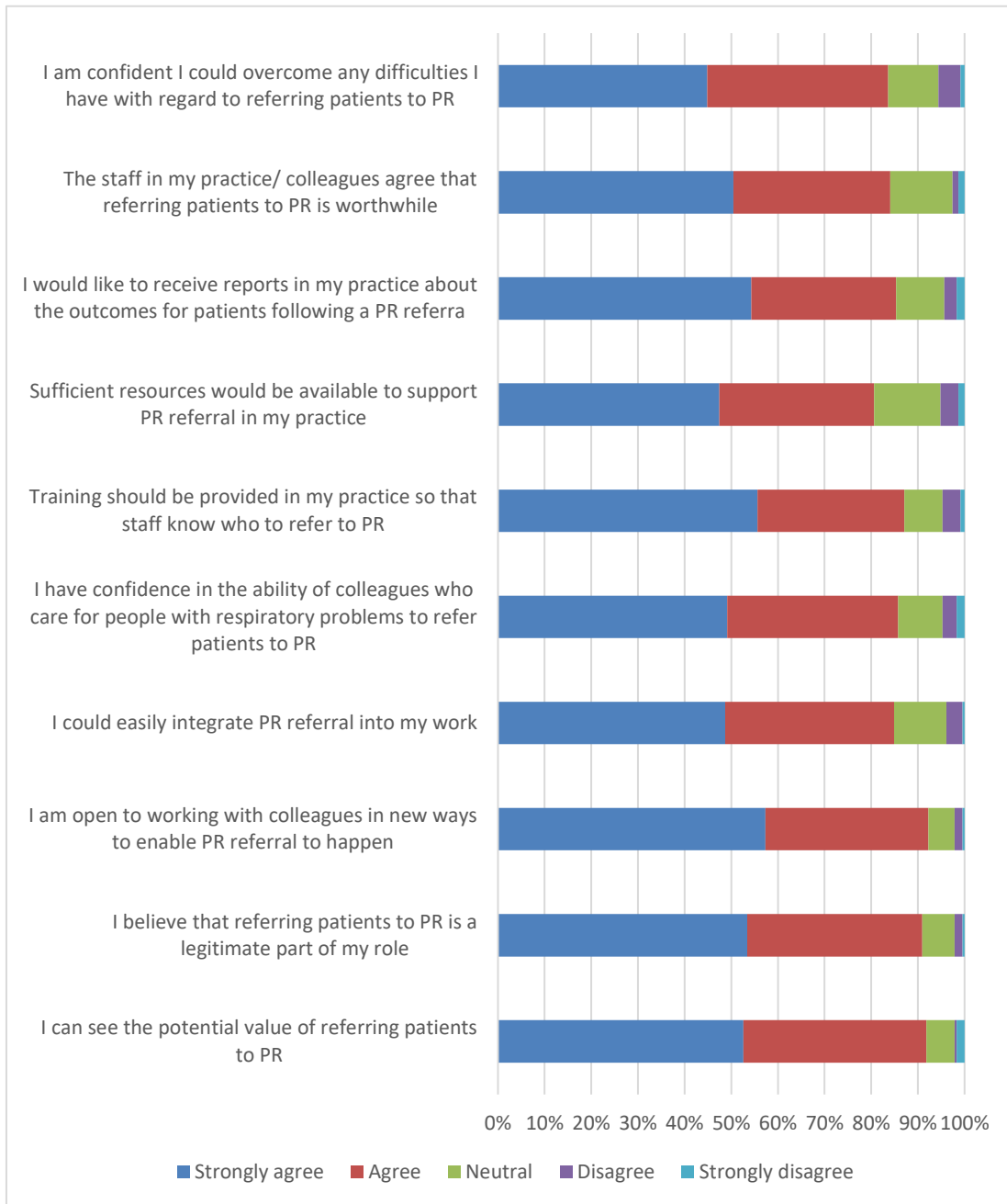


Figure 10 Believes about Pulmonary Rehabilitation

The main reason for referrals was functional deterioration, with over 90% of HCPs citing lower activity levels as a significant factor. Mobility disability and high MRC Dyspnea scores had a major influence on clinical decisions. On the other hand, the main obstacles

were logistical, particularly travel-related problems and a dearth of reputable PR firms. Uncertainty about the value of PR had virtually little bearing on the choice not to refer, therefore client-related issues like refusal were more important deterrents than professional skepticism. Professionally, more than 90% of respondents concurred that PR referrals are an appropriate and beneficial aspect of their clinical work. In addition to expressing a high desire for training and outcome reporting to support the process, HCPs expressed confidence in their capacity to incorporate these referrals into current processes.

**4.7. Q No-06; I feel adequately prepared to refer clients to pulmonary rehabilitation.**

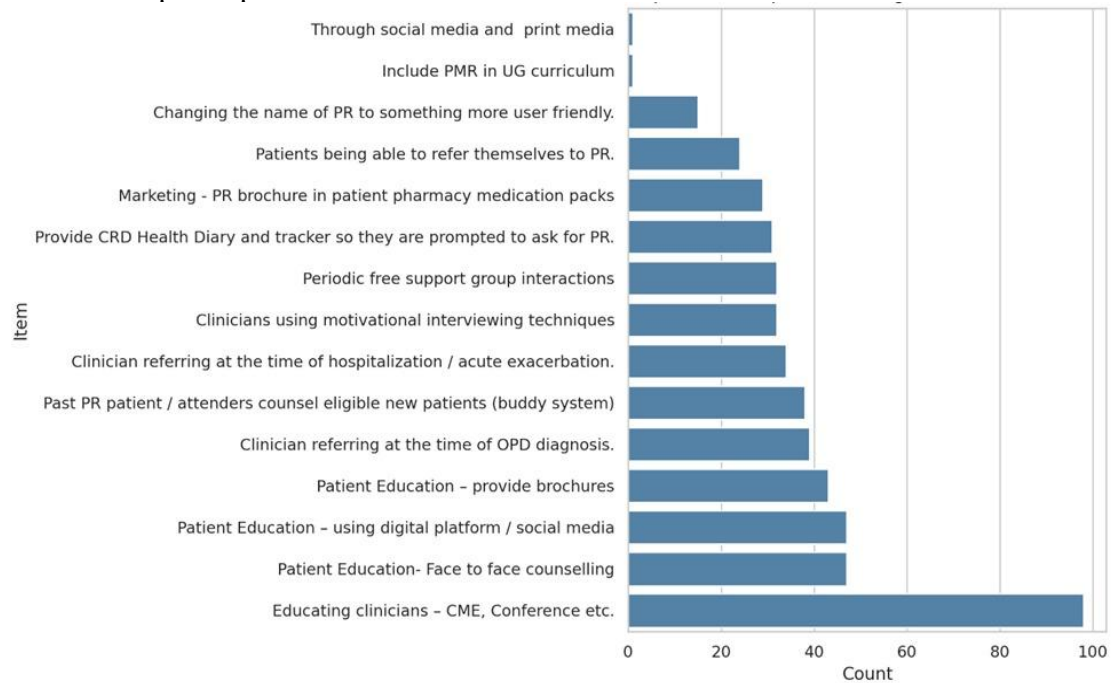
*Table 17 In my opinion, I am adequately prepared to refer patients to pulmonary rehabilitation*

<b>In my opinion, I am adequately prepared to refer patients to pulmonary rehabilitation</b>	<b>Counts</b>	<b>% of Total</b>	<b>Cumulative %</b>
<b>1</b>	4	1.7%	1.7%
<b>2</b>	3	1.3%	3.0%
<b>3</b>	4	1.7%	4.7%
<b>4</b>	7	3.0%	7.8%
<b>5</b>	18	7.8%	15.5%
<b>6</b>	11	4.7%	20.3%
<b>7</b>	25	10.8%	31.0%
<b>8</b>	38	16.4%	47.4%
<b>9</b>	35	15.1%	62.5%
<b>10</b>	87	37.5%	100.0%

High levels of perceived preparedness to refer customers for pulmonary rehabilitation were observed by healthcare professionals (HCPs). With 69% giving their level of readiness an 8 or higher, a sizable majority of respondents rated their level of readiness at the top of the scale. 37.5% (n=87) of the cohort chose a score of 10, indicating highest confidence. On the

other hand, only 7.8% (n=18) of participants rated their level of preparedness as 4 or lower.

**4.8. Q No – 7; What interventions/ strategies would you recommend to improve the PR referral and participation in India?**



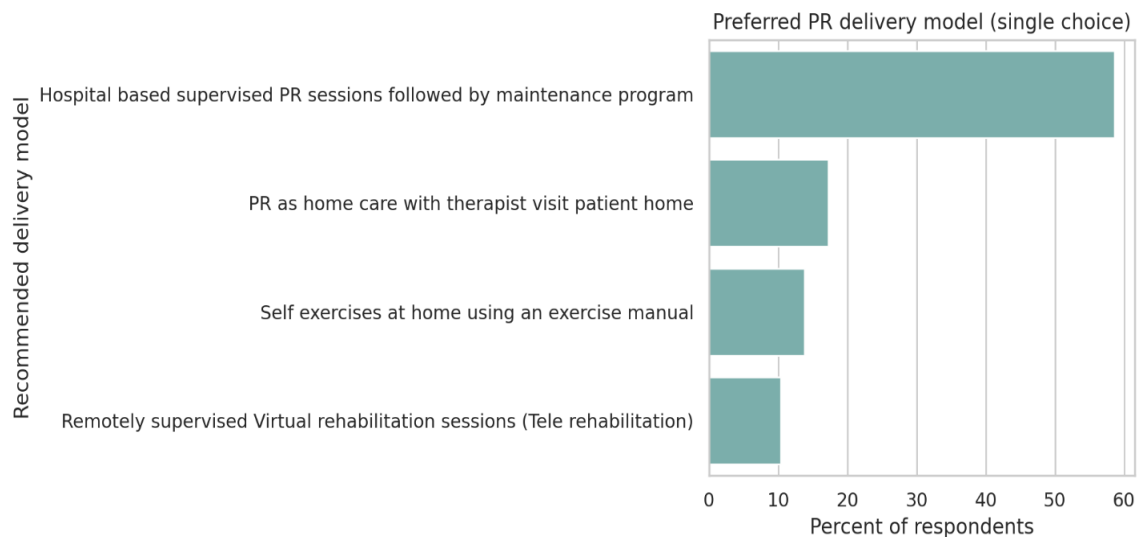
*Figure 11 Recommendations on the interventions/ strategies to improve the PR referral and participation in India*

Analysis of the multi-select responses reveals a strong preference for education- and clinician-led options to promote pulmonary rehabilitation (PR) uptake. The most frequently recommended treatments were teaching clinicians through CME programs and professional conferences, which were selected by roughly 21-22% of respondents (~50 picks), reflecting the greatest proportion of endorsements in the cohort. Following this, roughly 19-21% of respondents chose patient education options, such as face-to-face counselling and digital or social-media-based teaching, suggesting substantial support for direct patient involvement initiatives.

Timing-specific referral options, such as clinician referral at the time of OPD diagnosis, hospitalization, or acute exacerbations, received moderate endorsement, with roughly 13-17% of respondents choosing each.

Similarly, peer-support and behavioural interventions, such as previous PR attendees counselling new patients (buddy systems), motivational interviewing techniques, and regular support-group interactions, were supported by 14-16% of respondents, indicating consistent but secondary prioritization. In contrast, system-level or structural interventions showed significantly lower selection rates. Fewer than 10% of respondents chose strategies such as patient self-referral, changing PR to a more user-friendly word, and including PR in undergraduate curricula. Undergraduate curriculum inclusion received the lowest recommendation at around 2%. Overall, the distribution of responses shows a statistically significant preference for rapid, clinician- and patient-centered educational initiatives, with very little support for long-term structural or curricular improvements.

**4.9. Q No – 8; What do you think is the best way to deliver a PR, for CRD population in the Indian context?**



*Figure 12 Preferred PR Service Delivery Models*

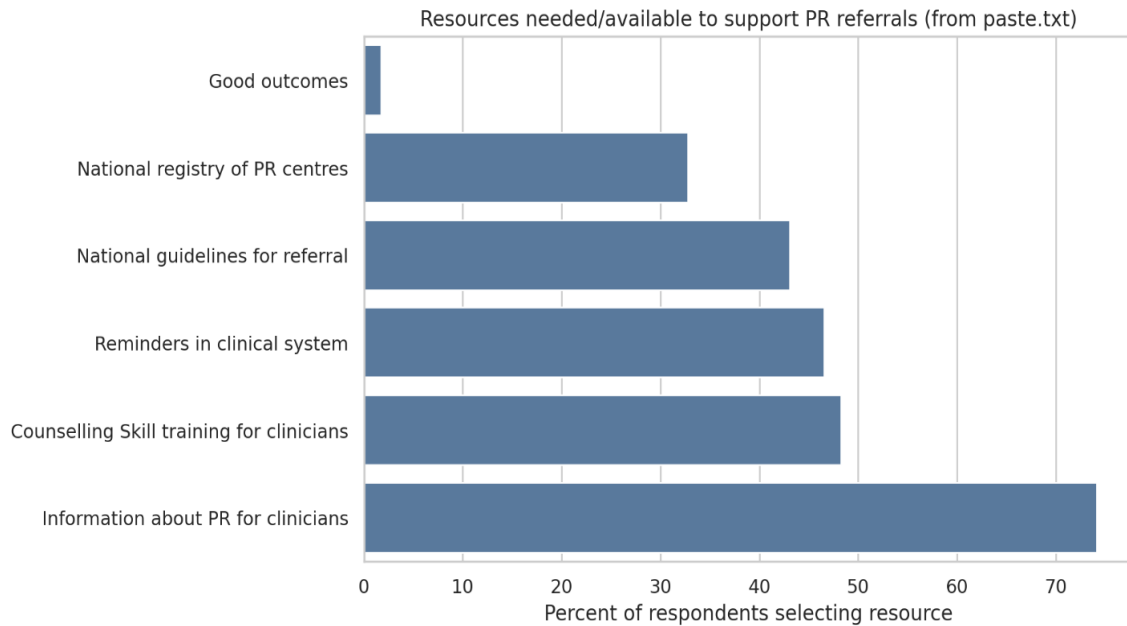
A clear bias towards hospital-based supervised programs was found when preferences for pulmonary rehabilitation (PR) delivery types were analysed. Strong support for organised, facility-based therapy with continuity into maintenance was demonstrated by the overwhelming majority of respondents (~60%) who chose hospital-based supervised PR sessions followed by a maintenance program as their preferred option. The perceived significance of supervised commencement in PR delivery was highlighted by this dominating choice, which significantly outperformed all other models.

The most popular substitute for hospital-based care, however, was home-based PR with therapist home visits, which was favoured by about 18% of respondents.

This implies that decentralised models are moderately accepted if professional oversight is maintained. About 14% of respondents chose self-directed at-home exercise using an exercise manual, suggesting a lack of confidence in unsupervised methods. Only about 10% of respondents supported remotely supervised virtual rehabilitation, or tele-rehabilitation, which was the least recommended choice.

Overall, the distribution shows a significant central trend towards in-person, supervised models, with preference gradually waning as the degree of direct clinical supervision drops. These results imply that, from the standpoint of healthcare professionals, entirely remote or self-managed models are seen as supplemental rather than primary forms of care, whereas initial supervision and organised delivery are crucial elements of successful PR.

**4.10. Q No -9;** What resources (Eg – tools, systems or processes) are available/needed in your practise to support clinicians in making PR referrals?



*Figure 13 Resources that could facilitate PR Referral*

Conversely, a much smaller percentage (~33%) chose structural resources like a national registration of PR centres, indicating that although service visibility is important, knowledge and workflow integration come first. Evidence of positive results was the least often recommended resource, chosen by just about 2-3% of respondents, suggesting that healthcare professionals' lack of faith in PR efficacy is not a significant obstacle. Overall, the response distribution shows a distinct statistical gradient that prioritises decision-support, training, and educational resources over structural or evidential requirements. These results imply that increasing clinician expertise, counselling skills, and real-time clinical system support—rather than producing more outcome evidence—is probably the best way to increase PR referral rates.

#### 4.11. Q No -10; Does India need high quality PR centres?

*Table 18 Does India need high quality PR centres?*

Variable	N	Missing	Mean	Median	SD	Minimum	Maximum
Is India in need of quality PR centers?	232	0	9.082	10.00	1.525	0	10

A strong professional consensus among healthcare providers highlights the perceived need for high-quality pulmonary rehabilitation (PR) facilities in India. A crucial demand was identified by analyzing survey data from 232 participants. On a 10-point rating scale, respondents reported a mean score of 9.08 and a median of 10.00. A standard deviation of 1.53, with responses concentrated at the upper end of the spectrum despite a full range of 0 to 10, further demonstrates the high degree of agreement. According to these findings, the development of a high-quality PR infrastructure is seen by medical experts as a crucial prerequisite for managing chronic respiratory diseases in the Indian clinical setting.

**4.12. Q No -11; Availability and access to Indian PR centres in comparison with global scenario?**

*Table 19 Availability and access to Indian PR centres in comparison with global scenario*

Variable	N	Missing	Mean	Median	SD	Minimum	Maximum
Availability of PR Centers in India Vs. Global Standards	232	0	1.754	2.00	1.458	0	7

When assessing the opinions of medical professionals regarding the availability of pulmonary rehabilitation (PR) facilities in India in comparison to international norms, the results consistently show a view of insufficient infrastructure. With a mean score of 1.75 and a median score of 2.00 on the assessment scale, the 232 participants in the sample as a whole gave national PR availability a very low rating. A wide professional consensus about the shortage of these facilities is highlighted by the small variation in replies, which is represented by a standard deviation of 1.46 and a score range from a minimum of 0 to a maximum of 7. Comparing India's respiratory care system to foreign standards reveals a significant institutional disparity.

**4.13. Q No - 12;** Are you aware of quality and accreditation in Pulmonary rehabilitation?



*Figure 14 Awareness on PR Quality and Accreditation*

59% of respondents have not heard of any Quality standards or Accreditation programme for Pulmonary Rehabilitation and this clearly indicates the lack of quality focus on systematization of processes and structure to yield good programme outcomes in a consistent manner. Also, programmes need to have documentation standard compliance to take data driven informed decision making – for Eg. Proportion of clients getting referred Vs program uptake, Proportion of clients availing index visits Vs programme completion etc. Lack of Quality indicators (KPI) and periodical quality review meetings could pave way for an inefficient and inadequate PR programme which could struggle to sustain over period. India needs a national PR Quality Guidelines, central registry and national clinical audits for Total Quality Management (TQM) in standardization across the nation as PR dedicated business ventures establish. This is a critical aspect considering scalability and sustenance. This study could potentially influence Indian Quality accreditation agencies/forums like National Accreditation Board for Hospitals and Healthcare Providers (NABH), Quality

Accreditation of India(QAI), Consortium of Accredited Healthcare Organizations(CAHO) Global Rehab Quality Forum etc. to draw attention towards Rehabilitation Market potential in India and come up with Quality standards pertaining to Hospitals and smaller clinics which are investing in PR as a specialty vertical.

#### **4.14. Summary of Findings**

When considered collectively, the results show that although medical professionals have a strong belief in the clinical value of pulmonary rehabilitation and prefer hospital-based supervised delivery models, the conversion of this belief into consistent referral practice is highly dependent on clinician-centric enablers rather than structural reforms. The high demand for easily accessible PR information, counselling skill training, and clinical system reminders, along with the emphasis on clinician education through CME and conferences, indicates that knowledge reinforcement and workflow integration are perceived as the most immediate levers for improving PR uptake. When taken as a whole, the findings demonstrate that while physicians strongly believe in the clinical benefits of pulmonary rehabilitation and favour hospital-based supervised delivery models, clinician-centric enablers rather than structural reforms are crucial for turning this belief into consistent referral practice. The emphasis on clinician education through CME and conferences, coupled with the high demand for readily available PR information, counselling skill training, and clinical system reminders, suggests that knowledge reinforcement and workflow integration are perceived as the most immediate levers for improving PR uptake.

#### **4.15. Conclusion**

The findings show that pulmonary rehabilitation is generally well-received by professionals, who strongly agree across disciplines that it improves symptoms, psychosocial outcomes, health literacy, and even lowers costs. Responses were more inconsistent in areas like healthcare utilization cost and nutritional status. While delivery preferences show that hospital-based supervised programs continue to be the gold standard in professional opinion, despite growing interest in home-based and virtual alternatives, differences in referral practices point to the significant role that physiotherapists, physiatrists, and pulmonologists play in spearheading PR advocacy.

## CHAPTER V:

### DISCUSSION

#### **5.1. Attitudes and awareness of HCPs towards pulmonary rehabilitation**

Healthcare professionals' (HCPs') perceptions and knowledge of pulmonary rehabilitation (PR) are frequently found to be important factors in program referral and enrollment. In the present study, healthcare professionals demonstrated generally positive attitudes toward pulmonary rehabilitation, with high self-reported awareness and confidence. On a 10-point scale, about 73.2% of respondents gave their comprehension of the PR eligibility requirements an 8 or above, and 42.2% expressed maximum confidence. Furthermore, 69% of participants said they were sufficiently equipped to send patients to PR. Referral practices were uneven despite this positive orientation, indicating a disconnect between positive attitudes and practical clinical application.

Although many HCPs recognized the advantages of PR, the results of this study showed that there was a wide range in their awareness and enthusiasm. This finding is consistent with global research indicating a discrepancy between conceptual backing for PR and real-world clinical referral procedures.

Only 3% of primary care doctors thought PR was helpful in managing COPD, according to Yawn *et al.* (2008), indicating a significant underestimation of its advantages (Pinnock and Sohanpal, 2016). According to Cox *et al.* (2017), contextual barriers, a lack of knowledge about the consequences, and knowledge gaps greatly reduced PR referral.

According to other studies, there is an unequal distribution of awareness, with physiotherapists and pulmonologists showing higher levels of awareness than general practitioners or nurses .

According to Johnston *et al.* (2013), underutilization of PR was caused by a lack of clarity surrounding eligibility requirements, referral procedures, and program availability.

This data supports the current conclusions that referral rates are still disproportionately low even though HCPs generally support PR in theory.

In order to close the gap between positive attitudes and consistent clinical practice, the literature suggests specific interventions, such as professional education and system-level referral mechanisms.

## **5.2. Knowledge and training gaps among HCPs**

Despite a high level of general PR awareness in this study, deficiencies in applied skill sets and depth of knowledge were found. Even though just 3.4% of respondents gave their comprehension a score of 4 or lower, a significant number said that they desired further training on PR elements, referral procedures, result reporting, and behavior-change assistance. This suggests that comprehensive, practice-ready knowledge does not always follow from apparent awareness.

It is well known that HCPs lack PR-related knowledge and training (BioMed Central PMC). The current study also showed that while there is a general awareness of PR, there is still a lack of in-depth knowledge regarding the program's components, referral processes, and anticipated benefits. These knowledge gaps are strongly linked to lower referral rates and inadequate incorporation of PR into standard care pathways (Jia *et al.*, 2025).

According to Jones *et al.* (2017), many HCPs are deficient in behavior-change support, motivational interviewing, and goal-setting—all of which are essential for delivering PR effectively. Notably, participants did not identify these deficiencies as areas in need of HCP training.

Deficits in physician knowledge and skills continue to be a significant obstacle to evidence-based care and adherence to guidelines, according to a recent mixed-methods systematic review by Jia *et al.* (2025). Educational programs with booster sessions were suggested as a means of establishing and maintaining competency.

In line with these sources, the current findings highlight the need for effective PR training to go beyond clinical measurement and prioritize interprofessional collaboration, customer-centered communication, and motivational support.

### **5.3. Perceived benefits of PR for customers and institutions**

The results of this study show that medical professionals strongly agree on the advantages of pulmonary rehabilitation. Over 60% of respondents stated that their referral decisions were unaffected by uncertainties about PR's efficacy, while over 90% of respondents felt that PR improves patient outcomes. These findings point to a high level of professional confidence in the institutional and clinical benefits of PR.

There is ample evidence to support PR's positive effects on client outcomes and institutional performance. PR continuously raises health-related quality of life, reduces dyspnea, and increases exercise capacity. Despite variations in program structure, Habib *et al.* (2020) found consistent improvements in functional exercise capacity, HRQoL, and dyspnea in their systematic review of PR in low-resource settings (Qin *et al.*, 2025; Habib *et al.*, 2020).

PR provides favorable cost-effectiveness, better resource utilization, and fewer hospital admissions on an institutional level; however, more recent reviews on BioMed Central are less likely to specifically cite institutional economic outcomes. However, this is consistent with the study's conclusion that organizational stakeholders and HCPs view PR as

advantageous from a clinical and administrative standpoint.

The paradox that benefits are recognized but uptake is still low is further reinforced by evidence that underutilization continues because of systemic constraints (Qin *et al.*, 2025; Habib *et al.*, 2020).

#### **5.4. Institutional prioritization and support compared to literature**

The discrepancy between the perceived need and actual availability of PR services in India was one of the study's most notable findings. The availability of PR services in India in comparison to international standards was assessed as extremely poor (mean score 1.75), while the necessity for high-quality PR centers was rated as extremely high (mean score 9.08; median 10). Instead of a lack of expert support, this indicates a systemic implementation gap.

According to qualitative analyses, institutional prioritization of PR is still insufficient in many healthcare contexts. Care for COPD is based on "shaky ground," according to Lundell *et al.* (2017), who also noted a disjointed service structure, low managerial involvement, a lack of resources, and little interprofessional coordination. Similar trends are found in other qualitative studies, such as those examining care in long-term facilities: Inadequate communication channels, poor teamwork, and a lack of COPD-specific expertise compromise the provision of care that complies with guidelines (Lundell *et al.*, 2017).

## **5.5. Barriers to Implementation Identified by HCPs**

In the current study, patient and system-level barriers to PR adoption were more common than those pertaining to clinicians. Lack of reliable PR centers in India, transportation issues, patient resistance, and institutional resource constraints were the most often mentioned obstacles. On the other hand, referral behavior was found to be substantially unaffected by clinician-level issues such lack of time, ambiguity regarding PR effectiveness, or low professional confidence.

### **5.5.1. Resource and staffing shortages**

One of the main obstacles to the widespread adoption of pulmonary rehabilitation (PR) in health systems is a lack of staff and resources. With delivery standards outlined in international statements and guidelines, PR is a complex, multidisciplinary intervention that calls for coordinated input from respiratory physicians, physiotherapists, nurses, psychologists, dietitians, and occupational therapists (Spruit *et al.*, 2013). PR is consistently described in international literature as being very effective but consistently underutilized, with workforce limitations frequently mentioned as a major factor limiting access (Rochester, 2024).

Program capacity is limited, waiting lists are lengthened, and session frequency or intensity is decreased due to a lack of PR-trained clinicians, which compromises adherence to evidence-based care models (Rochester, 2024). In low- and middle-income countries (LMICs), where limited funding, unequal training pipelines, and inadequate rehabilitation infrastructure limit program availability and the development of specialized skills, this gap is more noticeable (Bickton. and Shannon, 2022). A major system-level obstacle to PR implementation is workforce scarcity, which is also linked to a lack of interdisciplinary teamwork, according to narrative reviews that compile stakeholder perspectives (Augustine *et al.*, 2021).

The magnitude of the staffing issue is highlighted by empirical data. Only a small percentage of healthcare providers in Saudi Arabia's Eastern Province had previously heard of PR, according to a cross-sectional survey, and the most commonly mentioned obstacles to starting programs were a lack of hospital space, a lack of qualified personnel, and a lack of funding (Alsubaiei *et al.*, 2016). These results are consistent with qualitative evidence from LMIC settings that, even in the presence of supportive clinical leadership, program initiation, expansion, and continuity are hampered by a lack of human resources (Bickton. and Shannon, 2022).

Referral behavior is also impacted by staffing shortages. Due to time constraints and a lack of administrative assistance, primary-care physicians may neglect PR conversations, which results in a low referral rate and uneven eligibility patient identification (Early *et al.*, 2020). Only a small percentage of eligible patients were referred to PR, according to historical primary-care data from England and Wales. This trend, which includes significant attrition even prior to assessment, exacerbates program-level capacity limitations (Early *et al.*, 2020). A skills and systems gap that staffing improvements could partially address was reflected in previous qualitative research with general practitioners, which similarly revealed a lack of familiarity with referral procedures and a lack of knowledge about PR (Johnston *et al.*, 2013).

In order to provide quality and equitable PR access, international guidance highlights the importance of workforce development. It calls on services to keep an eye on waiting times and access, as well as to increase the multidisciplinary team's capacity (Holland *et al.*, 2021). Expanding continuing professional development, formalizing interdisciplinary roles that preserve time for exercise training, education, and behavior change support, and integrating PR competencies into undergraduate and graduate curricula are all examples of practical solutions (Holland *et al.*, 2021). If governance and supervision are strong, task-

shifting models—such as those with nurse or community health worker-led components under specialist supervision—may increase reach in areas with limited specialist availability (Bickton and Shannon, 2022).

By lowering travel barriers, enabling flexible scheduling, and allowing specialists to remotely supervise more customers while maintaining outcome gains, digital and hybrid delivery can further alleviate workforce bottlenecks (Lewis *et al.*, 2021). According to implementation studies, electronic prompts, collaborative primary-care pathways, and focused educational outreach to referrers all boost referral flow. To avoid downstream congestion, staffing levels must be increased to keep up with this increase (Early *et al.*, 2020). When considered collectively, the literature presents workforce capacity as a modifiable lever as well as a rate-limiting step; to achieve PR's proven benefits in a variety of healthcare contexts, consistent investment in staff, training, and team-based delivery is necessary (Spruit *et al.*, 2013).

### **5.5.2. Infrastructure and logistical limitations**

The implementation of pulmonary rehabilitation (PR) in healthcare systems around the world is severely hampered by logistical and infrastructure constraints. PR needs equipment for resistance and aerobic training, staff offices to facilitate interdisciplinary collaboration, educational rooms for client self-management sessions, and a dedicated area for exercise training. Program initiation and expansion are severely limited in facilities without adequate exercise space or designated rehabilitation units (Bickton and Shannon, 2022). Acute care is often given priority over physical infrastructure in hospitals, forcing rehabilitation services into shared or non-specialized settings, which reduces accessibility and quality.

A persistent obstacle in both high- and low-income nations is the geographic misdistribution of PR facilities. Less than 2% of Medicare beneficiaries access programs within a year after hospitalization, despite the fact that PR is advised for all eligible clients with chronic obstructive pulmonary disease (COPD) in the United States. This is primarily because there aren't any nearby facilities (Skinner *et al.*, 2019). In a similar vein, national audits conducted in the UK reveal inequalities in access, with rural areas experiencing longer waiting lists and heavier travel costs in comparison to urban areas where facilities are concentrated (Early *et al.*, 2020). Customers in settings with limited resources are disproportionately affected by this injustice, which frequently exacerbates socioeconomic disparities.

Logistics related to transportation represent yet another significant constraint. Many people with interstitial lung disease or COPD have limited mobility and are unable to drive long distances, which makes them dependent on expensive transportation services or caregivers. Traveling more than 30 minutes significantly lowers PR attendance and completion rates, according to observational studies conducted in the US and Canada (Johnston *et al.*, 2013). Physical access is just as important as professional availability, as these logistical obstacles continue to exist even in systems with sufficient staffing.

One of the most common reported limiting factors within facilities is inadequate or antiquated equipment. Exercise training may be less safe or intense in programs without treadmills, cycle ergometers, resistance training equipment, and monitoring devices, which would reduce results in comparison to evidence-based standards (Holland *et al.*, 2021). According to surveys conducted in Saudi Arabia, India, and Brazil, insufficient equipment and a lack of a dedicated clinical space are frequent obstacles to program development (Alsubaiei *et al.*, 2016). Funding limitations exacerbate these infrastructure deficiencies, especially in LMICs where acute services take precedence over capital investments in

rehabilitation.

Infrastructure vulnerability was further highlighted by the COVID-19 pandemic. The vulnerability of facility-based delivery models was brought to light by the widespread closure of PR centers during lockdowns. Randomized controlled trials have shown that tele-rehabilitation is a viable alternative to center-based programs when proper digital infrastructure and supervision are offered (Lewis *et al.*, 2021). Digital disparities still exist, though, as a lack of internet access, low digital literacy, and a lack of telehealth resources continue to be barriers to widespread adoption, especially for underserved and older populations.

It takes a multifaceted approach to overcome logistical and infrastructure obstacles. With specific funding streams for facility development, policymakers must give rehabilitation space top priority when planning hospitals and communities. Decentralizing PR into primary care and community centers can improve geographic accessibility and lessen the burden of travel. Scalability is provided while maintaining patient safety and results (Lewis *et al.*, 2021) by integrating hybrid models that combine tele-rehabilitation with supervised in-person sessions. Additional creative solutions to infrastructure disparities are offered by shared-use rehabilitation facilities and mobile PR units, which are already being tested in rural Canada and some regions of Australia.

In conclusion, program capacity is restricted by staffing shortages, but the physical viability and equity of PR delivery are determined by logistical and infrastructure shortcomings. Despite strong evidence of clinical efficacy, the expansion of PR services will remain limited in the absence of strategic investments in space, equipment, transportation solutions, and digital infrastructure.

### 5.5.3. Referral practices and client selection issues

One major obstacle to pulmonary rehabilitation (PR) that affects access and uptake in various healthcare systems is referral procedures and client selection. Even among eligible clients, PR is still wildly underutilized, according to utilization data. Just 1.9% and 2.7% of hospitalized COPD patients, respectively, were receiving PR within six and twelve months of their discharge, according to a large U.S. cohort (Spitzer *et al.*, 2019).

These results are supported by international audits; a national review conducted in the United Kingdom revealed that only 16% of COPD patients who qualified for primary care were referred to PR. Similarly, more than 90% of studies reported referral rates of 35% or less, according to a scoping review that looked at ten developed nations (Lahham and Holland, 2021).

These low rates are a result of significant behavioral barriers among clinicians. According to a scoping review, healthcare professionals most frequently cited a lack of understanding about PR and its advantages as well as uncertainty about referral procedures as obstacles (Milner *et al.*, 2018). Similar limitations were highlighted by qualitative research from Australia, where general practitioners identified a lack of clarity regarding client access, logistical difficulties, and insufficient awareness as the main barriers; the only constant facilitator for referral was knowledge of PR benefits (Johnston *et al.*, 2013).

Gaps in equity are further exposed by referral behavior patterns. Only 6.2% of referrals to PR came from general practitioners, frequently for patients with moderate disease severity, according to an Australian primary care audit; very few clinicians referred more than one patient (Cox *et al.*, 2024).

Studies on client selection draw attention to the paradox that, despite their potential greater need, sicker patients or those with multiple comorbidities are frequently not

prioritized for early intervention and instead receive delayed referrals. Low engagement is also influenced by patient-level factors that affect clinician referral decisions, such as perceived lack of benefit, transportation limitations, and social or psychological barriers (Rochester, 2024; Augustine *et al.*, 2021).

Providing clinician education on PR eligibility and benefits, as well as integrating structured referral pathways into clinical workflows and electronic health records, are ways to lessen these problems. It has been shown that interventions like primary care training, discharge planning integration, and automated prompts can improve referral consistency (Lahham and Holland, 2021; Milner *et al.*, 2018).

#### **5.5.4. Client adherence and cultural/psychological barriers**

In pulmonary rehabilitation (PR), customer adherence and completion rates are consistently low, which seriously compromises the efficacy of the program. According to a prospective study conducted in Spain, the main causes of the 38.5% dropout rate were poor motivation and problems with transportation. Additionally, non-adherent patients had higher rates of exacerbation, steroid use, smoking history, and decreased functional capacity (Almadana *et al.*, 2017).

Non-adherence is caused by a variety of psychosocial factors. According to a qualitative synthesis, the main psychological obstacles are anxiety, depression, low self-efficacy, and inadequate coping strategies (Oates *et al.*, 2019). Participation is further hampered in low- and middle-income settings by cultural customs, financial strains, reliance on caregivers, and fatalistic health beliefs (Sami *et al.*, 2021).

Logistical challenges are highlighted by additional research. According to a retrospective cohort study, smoking, living alone, and having less capacity for exercise were

all substantially linked to non-attendance and dropout (Conal *et al.*, 2013). Adherence is frequently interrupted by practical burdens, such as exhaustion, comorbidities, and distance to facilities (Conal *et al.*, 2013).

Adherence-boosting interventions have potential. Customized approaches, like transportation assistance, flexible scheduling, peer or family support, motivational interviewing, and the availability of home-based or tele-rehabilitation formats, have been shown in systematic reviews to increase completion and engagement (Young *et al.*, 2017).

Attendance rates were significantly higher in a randomized controlled trial with patient-held educational materials than in control groups (Young *et al.*, 2017). These interventions focus on customer empowerment and self-management in addition to logistical challenges.

Therefore, enhancing PR adherence necessitates integrated solutions that take into account socioeconomic constraints, cultural context, psychological preparedness, and geographic barriers. Benefits of PR are limited to the small percentage of customers who successfully finish the program in the absence of such a comprehensive, client-centered approach.

#### **5.5.5. Institutional and administrative challenges**

The implementation and scalability of pulmonary rehabilitation (PR) are severely constrained by institutional and administrative factors, which frequently determine the success or failure of programs. The main funding constraint is still that many healthcare systems do not give PR top priority in their budgets, which results in services that are underfunded. Despite having comparable cost-effectiveness profiles, comparative studies have revealed that PR is paid much less than similar interventions like cardiac rehabilitation (Rochester, 2024).

PR program coordinators and champions are often absent from leadership structures. PR services find it difficult to coordinate interdisciplinary teams, secure resources, and maintain consistency in the absence of clear administrative ownership. Fragmented care and poor communication result from the lack of standardized referral pathways and ambiguous professional roles, particularly among respiratory physicians, physiotherapists, nurses, and primary care providers (Augustine *et al.*, 2021).

PR adoption is further hampered by environmental complexity and organizational culture. Even in institutions with structural capacity, adoption is hampered by issues like rigid workflows, a deluge of guidelines, conflicting clinical priorities, and a lack of administrative time, according to implementation science frameworks (Jia *et al.*, 2025). For instance, patients are frequently lost to follow-up when discharge procedures are not standardized to incorporate PR referral prompts (Young *et al.*, 2017).

Inadequate performance measurement and data monitoring are also common. Accountability mechanisms are absent from institutions that do not have systems in place to efficiently track referrals, attendance, outcomes, or waiting times. The administrative underwriting of PR programs and service improvement are hampered by the lack of formal metrics (Rochester, 2024).

Several successful organizational strategies are supported by emerging evidence. The availability and uptake of PR services are consistently increased when they are formally commissioned as reimbursable components of healthcare delivery. Customer attrition is decreased and referral rates are raised when PR is integrated into electronic discharge order sets. The program cycle is maintained, and workflows are made more efficient by the appointment of committed PR coordinators (Early *et al.*, 2020). Continuous quality improvement and managerial support are made possible by performance-based tracking, which includes auditing waiting times and completion rates.

It is essential to demonstrate the clinical and financial advantages of PR in order to engage institutional leadership. Reduced hospital readmissions, increased exercise capacity, and improved quality of life are all metrics that administrators looking for value in care delivery find appealing, according to cost-benefit analyses (Rochester, 2024). However, regardless of its demonstrated effectiveness or support from guidelines, PR is still marginalized in the absence of administrative commitment.

In conclusion, administrative and institutional barriers are complex and intricately woven into organizational structures. Leadership support, structural integration, resource allocation, workflow redesign, and performance accountability are all necessary to overcome them and are essential to PR's long-term success.

## **5.6. Facilitators and Opportunities**

The current study found several PR implementation facilitators despite the obstacles found. High levels of readiness, professional drive, and desire to incorporate PR into standard care was noted by healthcare professionals. Additionally, there was a lot of support for technology-enabled delivery methods including tele-rehabilitation, institutional leadership, structured referral pathways, and interdisciplinary collaboration.

### **5.6.1. Multidisciplinary collaboration and teamwork**

Effective pulmonary rehabilitation (PR) delivery is known to be facilitated by multidisciplinary collaboration. Structured care, client engagement, and sustainable workload distribution are all improved by integrated team models that incorporate doctors, nurses, physiotherapists, psychologists, and dietitians. For instance, structured collaboration among allied professionals has been shown to improve clinical coordination and patient outcomes in

a multidisciplinary respiratory service in Australia (McDonald *et al.*, 2022).

The adoption of guidelines, including PR, is facilitated by strong interprofessional relationships, clear role understanding, and coordinated communication, according to qualitative implementation research. The main drivers of clinical implementation, according to healthcare personnel, were "peer support," "shared responsibility," and "mutual trust" (Milner *et al.*, 2018).

Preoperative pulmonary programs employing multidisciplinary teams, such as physiotherapists and nutritionists, have significantly decreased postoperative pulmonary complications in surgical settings. These results highlight the quantifiable benefits that interdisciplinary models across respiratory care pathways can provide (Harada *et al.*, 2013).

Multidisciplinary teamwork fosters knowledge sharing, builds resilience against operational barriers, and accelerates implementation, according to other qualitative analyses conducted among professionals. Peer learning and group problem-solving are mentioned as key factors that contribute to program sustainability (Milner *et al.*, 2018).

Since shared accountability for action strengthens it, the establishment of formal multidisciplinary structures (e.g., collaborative care plans, shared case conferences) is linked to higher program completion and referral rates. Clinicians reported increased customer trust, referral equity, and clarity in settings that implemented interdisciplinary coordination through shared workflows.

In summary, by integrating services into standard care, sharing accountability, and bolstering clinical competence, multidisciplinary collaboration improves PR implementation. A key chance to improve PR access and quality is to institutionalize multidisciplinary frameworks like interprofessional case management, shared planning rounds, and team-based training.

### **5.6.2. Institutional leadership and administrative support**

The adoption of pulmonary rehabilitation (PR) is significantly aided by administrative assistance and institutional leadership. Services receive funding, visibility, and sustainability when organizational leaders actively support public relations. Access and regular referrals rise dramatically in jurisdictions where PR is officially commissioned and integrated into chronic care frameworks (Rochester, 2024).

Referral consistency increases when PR is incorporated into electronic discharge order sets and key performance indicators, according to administrative data from chronic care settings. Reliance on clinician initiative alone is decreased when referral prompts are integrated into institutional workflows (Young *et al.*, 2017).

Strategic resource allocation, including staffing, equipment, and space, is made possible by leadership endorsement. Key results like the referral-to-enrollment ratio and attendance rates are much higher in programs with assigned PR coordinators and obvious administrative ownership (Early *et al.*, 2020).

Implementation frameworks also stress how leadership support aids in coordinating PR with the larger institutional goals of managing chronic diseases and providing preventive care. Leaders are more inclined to support program expansion if they are aware of PR's cost-effectiveness, which includes decreased readmissions and increased functional independence (Rochester, 2024).

Resource silos are reduced, cross-departmental collaboration is enhanced, and PR is integrated into pathway design when the institution's vision incorporates rehabilitation as a core service rather than an elective add-on. According to implementation science analyses, among the most reliable facilitators in healthcare settings are administrative assistance and

leadership (Milner *et al.*, 2018).

In conclusion, the establishment and sustainability of PR programs are significantly influenced by institutional leadership. A clear route to successfully scaling PR services within healthcare organizations is provided by administrative strategies, such as assigning leadership roles, integrating pathways, aligning performance metrics, and providing enabling infrastructure.

### **5.6.3. Business Integration into chronic disease care pathways**

Implementation is greatly aided by the incorporation of pulmonary rehabilitation (PR) into official chronic disease pathways. Referral, uptake, and continuity all improve when PR is in line with disease management protocols, such as clinical pathways for heart failure or COPD. Regular referrals as part of care standards are made possible by integrated models (Rochester, 2024).

Long-term results are better for chronic care models that incorporate PR into disease self-management frameworks; patients enroll earlier, finish programs more frequently, and sustain benefits over time (Young *et al.*, 2017).

Holistic customer management is also promoted by integrating PR into integrated care pathways. In addition to medication adjustment, self-management education, and follow-up rehabilitation, multidisciplinary teams work with chronic care coordinators to provide customized PR (Milner *et al.*, 2018).

Incorporating PR into chronic care review programs and care bundles for COPD exacerbations is consistently advised by international guidelines. PR uptake is clearly higher in areas where these recommendations are implemented in regional care networks (Milner *et al.*, 2018).

By standardizing referral triggers for all eligible patients and lowering reliance on clinician discretion, pathway integration promotes equity. Additionally, it facilitates patient navigation by assisting patients with scheduling, transportation, and follow-up throughout care episodes through care coordination (Milner *et al.*, 2018).

In summary, PR that is in line with chronic illness care pathways promotes equity, strengthens referrals, and lessens fragmentation. A strategic facilitator that guarantees systematic delivery as opposed to opportunistic referral is the institutionalization of PR within disease management frameworks.

#### **5.6.4. Use of technology and tele-rehabilitation business model**

Technology-enabled delivery, such as tele-rehabilitation, is a major enabler for expanding access to pulmonary rehabilitation (PR). Randomized controlled trials demonstrate that, when compared to center-based PR, home-based telerehabilitation results in comparable improvements in exercise capacity, health status, and self-efficacy and significantly lowers hospitalizations and ED visits (Paolo *et al.*, 2022). Cochrane and systematic reviews confirm telerehabilitation as a safe and effective alternative, improving uptake, adherence, and access with few adverse events (Cox *et al.*, 2021).

Evidence supports web-based PR platforms, with meta-analyses reporting increases in physical activity (daily step count), health-related quality of life, and maintenance of benefits when delivered through internet platforms, particularly with program flexibility (Ayala-Chauvin *et al.*, 2024).

Additionally, technology breaks down barriers to mobility and geography. Rural, mobility-impaired, and socioeconomically vulnerable populations can participate in PR through videoconferencing, mobile apps, and remote monitoring (Cox *et al.*, 2021).

By adjusting the intensity of follow-up, removing travel burdens, and enhancing retention, blended or hybrid models—which combine in-person and remote components—improve flexibility and sustainability, according to implementation reviews (Watson *et al.*, 2023).

In conclusion, adopting technology, especially telerehabilitation, is a powerful way to scale PR. Its efficacy, safety, and capacity to reach marginalized populations are all supported by high-quality evidence. A significant chance to get around conventional access restrictions is provided by the organized incorporation of tele-rehabilitation into routine care.

#### **5.6.5. Role of continuous professional development**

Pulmonary rehabilitation (PR) is made possible in large part by continuous professional development (CPD). Improved referral rates result from targeted training that boost clinician confidence in PR benefits, eligibility requirements, and referral processes (Milner *et al.*, 2018). According to implementation reviews, health professionals who deliver evidence-based interventions can effectively modify their behavior by utilizing "educational meetings," "continuous training," and "peer influence" (Qin *et al.*, 2025). Physiotherapists, nurses, doctors, and other allied professionals participate in interprofessional workshops that promote common understanding, standardize referrals, and develop local PR champions. These cooperative training programs promote service sustainability (McDonald *et al.*, 2022).

In low-resource settings, CPD programs delivered via online modules or blended delivery expand training reach. When delivered with case-based learning and mentorship, these programs increase clinician skills in behavior change, exercise prescription, and patient engagement (Cox *et al.*, 2021).

Strengthening knowledge through CPD correlates with attitude shifts; clinicians report increased referral confidence and positive perception of PR when educated via interactive sessions (Watson *et al.*, 2023).

In sum, CPD cultivates a skilled workforce proficient in PR delivery, reinforcing multidisciplinary collaboration, facilitating systems integration, and driving customer enrollment. Investment in regular, accessible CPD tailored to clinician roles is essential for scaling and sustaining program effectiveness.

## **5.7. Institutional Dynamics and Organizational Perspectives**

The results of this study indicate that pulmonary rehabilitation is generally supported by Indian healthcare professionals' institutional culture; nevertheless, organizational preparedness in terms of infrastructure, leadership commitment, and administrative processes is still lacking. Sustainable PR implementation is severely hampered by this mismatch between institutional capacity and professional willingness.

### **5.7.1. Influence of institutional culture on PR service adoption**

The adoption and sustainability of pulmonary rehabilitation (PR) in healthcare settings are greatly influenced by institutional culture. PR services are more likely to be used in a culture that prioritizes integrated, preventive care and ongoing quality improvement. Research from the implementation science literature shows that a company culture that prioritizes creativity, teamwork, and patient-centeredness is consistently linked to more successful PR initiatives (Milner *et al.*, 2018).

How PR is viewed in various professions is influenced by cultural norms. PR is more easily incorporated into standard care pathways in settings where respiratory medicine,

physiotherapy, nursing, and rehabilitation are respected and empowered. According to Perera *et al.*, culturally sensitive methods that respect regional beliefs and modify instructional materials encourage greater patient and clinician involvement (Perera *et al.*, 2025).

On the other hand, PR frequently receives little support from organizations with hierarchical cultures, where rehabilitation is seen as ancillary. Referrals and participation are decreased by professional silos and a lack of interprofessional respect. Research shows that hierarchical organizations often deprioritize PR and other team-based interventions (Augustine *et al.*, 2021).

Internal momentum is created by a shared culture that incorporates PR into the institutional narrative through advocacy for rehabilitation, cross-disciplinary visibility, and leadership endorsement. PR is reaffirmed as a necessary and expected part of chronic respiratory care by this institutional identity formation (Milner *et al.*, 2018).

In conclusion, institutional culture either facilitates or hinders the adoption of PR, depending on whether it is hierarchical and siloed or collaborative and customer-focused. One effective way to integrate PR into organizational procedures is to foster a culture of open communication, high regard for preventive care, and respect for one another's professional abilities.

### **5.7.2. Comparative service models from other countries/institutions**

Different approaches to successful implementation are revealed by comparative studies of pulmonary rehabilitation (PR) programs from various nations and organizations. By incorporating PR into routine COPD care pathways, the National Health Service in the UK has achieved above-average completion rates and increased national awareness. This model is distinguished by its well-organized referral processes, committed funding, and robust interprofessional coordination (Milner *et al.*, 2018).

PR is introduced to primary care clinics and rural health facilities in Australia through multi-site PR programs that integrate community-based models. By utilizing local therapists as coordinators and encouraging shared ownership across healthcare settings, these programs optimize accessibility and adaptability (Milner *et al.*, 2018).

LMICs, or low- and middle-income nations, offer convincing examples of PR adaptation. A culturally-adapted public relations program in Kyrgyzstan, for instance, improved uptake and cultural acceptability by customizing educational content and delivery to the local context (Akyzbekov *et al.*, 2022).

The PR implementation model in China provides insightful information. Peer influence, localized adaptation, digital referral tools, and policy-level support were identified as facilitators that enhanced guideline adoption across several institutions in a recent qualitative study that used the Consolidated Framework for Implementation Research (CFIR) (Lam *et al.* 2021).

These comparative models show how flexible adaptation—such as decentralized care, digital tools, community engagement, and context-sensitive education—can successfully integrate PR across various health systems. Customized models stay true to therapeutic principles while leveraging local strengths.

In conclusion, studying PR implementations in various international contexts reveals a variety of instructive strategies. High-income country lessons focus on institutionally sponsored, structured models, whereas LMIC approaches demonstrate cultural localization and flexibility. Designing sustainable, locally relevant PR services is guided by an understanding of these models.

### **5.7.3. Organizational readiness and sustainability of PR programs**

A key factor in the long-term viability of pulmonary rehabilitation (PR) programs is organizational readiness, or the mental and physical preparedness of institutions. Institutions with high Organizational Readiness (ORC) indicate better program launch, staff engagement, and long-term maintenance, according to a recent study that applied Assessment of Organizational Readiness (ORC) frameworks to rehabilitation contexts (Nizeyimana, Joseph and Louw, 2023).

Two essential components make up the concept of readiness: (1) psychological readiness, or staff perceptions of the worth and viability of PR; and (2) structural readiness, or the accessibility of procedures, leadership support, and resources. Program durability is higher in institutions that are improving both dimensions (Caci *et al.*, 2025).

However, after the initial roll-out, institutions that are not prepared—as indicated by low ORC scores—face challenges with staffing turnover, irregular referrals, and quick program disintegration. According to qualitative research, when champions depart or funding declines, PR implementation frequently fails due to a lack of preparedness (Nizeyimana, Joseph and Louw, 2023).

## **5.8. Research Significance**

This study offers empirical data from Indian medical professionals showing that although pulmonary rehabilitation (PR) is widely accepted in theory, it is still not well applied in reality. The results showed high levels of professional confidence and awareness, with approximately 69% of respondents feel ready to recommend patients and over 70% having a solid comprehension of PR eligibility. Despite this, systemic, institutional, and logistical obstacles rather than clinical resistance continue to impede referral uptake.

The study found a substantial gap between India's need and supply of PR services. Healthcare professionals evaluated India's present PR availability in comparison to international standards as very low (mean score 1.75), while they ranked the need for high-quality PR centers as extremely high (mean score 9.08). This discovery demonstrates that inadequate PR penetration is caused by infrastructure and access constraints rather than a lack of clinical approval and draws attention to a significant unmet healthcare need in the management of chronic respiratory illnesses (CRDs).

By identifying preferred PR delivery options, such as institution-based, home-based, and tele-rehabilitation procedures, the study's findings offer practical insights for healthcare business development. A promising prospect for scalable PR services across hospitals, physiotherapy clinics, home-care services, and tele-rehabilitation platforms in India is indicated by the strong professional endorsement of hybrid and technology-enabled models.

Despite the high level of public knowledge of PR, the study found that interdisciplinary coordination, outcome reporting, behavior-change support, and referral procedures all need skill improvement. In order to convert conceptual understanding into

reliable clinical practice, these results highlight the significance of focused professional training and ongoing professional development initiatives.

The study concluded that rather than clinician uncertainty or lack of confidence, referral hurdles were mostly associated with patient-level and system-level constraints, such as transportation difficulties, a lack of reliable PR centers, and patient rejection. In order to increase PR access and adoption, these insights directly influence the creation of discharge-based referral triggers, structured referral processes, and patient education initiatives.

The study's conclusions emphasize the significance of culturally sensitive PR strategies appropriate for India's varied healthcare environment, which includes community-based care settings, government hospitals, primary health centers, NGOs, and private hospitals. The findings demonstrate that it is feasible to improve patient acceptance, adherence, and sustainability in low-resource and rural settings by employing culturally acceptable methods, such as clinical yoga therapy and community-based PR initiatives.

This study offers evidence to support policy-level advocacy for incorporating PR into national chronic illness management plans by measuring systemic gaps and professional readiness. The findings also provide grounds for PR services to be covered by insurance, which may reduce the financial burden on patients, increase referral uptake, and improve long-term health outcomes. Overall, this study's importance goes beyond determining whether pulmonary rehabilitation is necessary. The findings offer a workable, evidence-based road map for creating high-quality, reasonably priced, scalable, and sustainable PR services in India that are compatible with both institutional and community-based healthcare models by connecting the viewpoints of healthcare professionals with quantifiable system-level gaps.

## **5.9. Strengths and Weakness of the study**

This study's integration of quantitative findings with implementation-focused interpretation is a key strength, allowing results to directly inform scalable PR delivery strategies.

Based on existing evidence, this would be the first-of-its-kind study done among Indian Healthcare Professionals in a comprehensive manner, involving diverse healthcare professionals who have opportunities to be involved in providing care for CRDs. The heterogeneity assisted capturing diverse perspectives from a variety of professional roles which gave much deeper insights into the knowledge, beliefs and attitudes as well as perceived enablers and barriers to referral of CRD clients in India. Along with the multidisciplinary clinicians, the target population included healthcare administrators who are key opinion leaders and have high potential in establishing well-structured PR business across various settings. The study findings could positively influence the business establishments of PR as a healthcare specialty vertical in hospitals, physiotherapy clinics, home care segments as well as Tele-rehabilitation ventures.

Achieving adequate reach and engagement among multiple professional groups, such as nutritionists, psychologists and occupational therapists did present challenges. Similarly, obtaining active participation from busy practising physicians proved to be difficult. Furthermore, securing responses from clinicians practising across different Indian states was tough, however, their input provided in offering insights from diverse professional settings and geographical contexts.

In conclusion, the cornerstone of PR sustainability is organizational preparedness. High readiness institutions are much more likely to sustain program quality, adjust to change,

and integrate PR over the long run because they are structurally supported and psychologically motivated to run a successful business model. One of the first priorities in PR business deployment strategies should be to evaluate and improve preparedness.

CHAPTER VI:  
IMPLICATIONS AND RECOMMENDATIONS

**6.1. Implications for business practice**

**6.1.1. Impact of HCP perspectives on customer referrals and adherence**

The opinions of healthcare professionals (HCPs) have a significant impact on customer adherence to pulmonary rehabilitation (PR) as well as referral trends. Research shows that when health care professionals prioritize PR programs in the routine management of chronic respiratory conditions and acknowledge their advantages, clients are much more likely to be referred to them. According to a European multicenter study, the main factors influencing referral rates were active encouragement and physician endorsement (Watson *et al.*, 2023).

Nonetheless, under-referral is frequently documented, and the reasons for this include low institutional prioritization, ignorance, and misunderstandings about eligibility. According to a Canadian survey, referral inertia and a lack of physician knowledge were the main reasons why only a small percentage of eligible patients with Chronic Obstructive Pulmonary Disease (COPD) were referred to PR (Johnston *et al.*, 2013).

Patient adherence is also directly influenced by HCP viewpoints. According to a review, patients showed increased participation and completion rates when HCPs actively explained the purpose and results of PR. On the other hand, disengagement resulted from ambiguous or inconsistent messaging (Erkel *et al.*, 2022).

Additionally, research shows that client-centered communication and cultural sensitivity enhance adherence. Supportive HCP–patient interactions decreased psychological barriers like stigma and fatalism, improving sustained participation in COPD self-management programs, according to research (Yawn, 2024).

As a result, HCPs play a crucial role as gatekeepers for PR by influencing referral choices, emphasizing the value of PR, and encouraging adherence over time. Thus, filling in knowledge gaps and promoting favorable HCP attitudes toward PR can directly boost customer involvement and enhance long-term results in the treatment of Chronic Respiratory Diseases (CRDs).

## **6.2. Implications for managerial, Policy and Health Systems**

### **6.2.1. PR as part of standard respiratory care policy**

According to organizations like the American Thoracic Society and the European Respiratory Society, Pulmonary Rehabilitation (PR) is a fundamental practice that is widely acknowledged as being essential to the management of respiratory diseases (Spruit *et al.*, 2013). Like pharmacotherapy or acute exacerbation management, PR becomes a normative intervention when it is incorporated into standard respiratory care policy.

Greater service availability, uniform referral practices, and wider population access are all displayed by nations like the UK that require PR under national clinical guidelines and reimbursement frameworks (Lahham *et al.*, 2021). Ad hoc service delivery is decreased and institutional accountability is ensured when PR is incorporated into chronic disease management policies.

Enhancing continuity of care and promoting systematic enrollment are two benefits of integrating PR into bundled care packages, such as post-hospital COPD discharge protocols (Ospina *et al.*, 2016). Benchmarking, transparency, and ongoing quality improvement are made possible by standardizing performance metrics within policy frameworks, such as referral rates and 6-month completion.

Including PR in policy also makes funding and insurance coverage easier, which lowers the financial obstacles that prevent implementation. Despite compelling evidence of

its efficacy and cost-benefits, PR is still marginalized in the absence of policy inclusion. For fair and long-lasting access, PR must be made a required part of respiratory care policy in India.

### **6.2.2. Economic and cost-effectiveness considerations**

Cost-effectiveness and even cost savings are consistently demonstrated by pulmonary rehabilitation (PR), especially when it is given following exacerbations of COPD. PR resulted in an average net savings of \$5,721 per patient and 0.53 extra quality-adjusted life years (QALYs) when compared to no PR, according to a U.S. economic evaluation using a Markov microsimulation model (Mosher *et al.*, 2022).

Complementary analyses, like a study in a European cohort, demonstrate that out-patient PR programs improve quality of life scores and significantly lower exacerbation-related costs, which are estimated to be over €1.8 million annually (Maria *et al.*, 2023). These findings highlight their clinical and financial worth.

Long-term system benefits result from incorporating PR into disease care pathways. Research demonstrates that PR lowers ED visits and hospital readmissions, improving patient functioning and saving money on healthcare (Rochester, 2024).

Group-based delivery, community-based environments, and tele-rehabilitation models that lower infrastructure needs while increasing reach all contribute to cost-efficiency. These developments reduce program expenses while preserving clinical efficacy.

Evidence showing a significant return on investment in PR in the form of lower acute-care costs, better client outcomes, and improved quality of life is helpful to policymakers. Scaling PR within limited health budgets is supported by matching funding sources and reimbursement schemes with cost-effectiveness data.

### **6.2.3. Strategies for scaling PR at institutional and national levels**

Effective pulmonary rehabilitation (PR) scaling necessitates a multi-level, coordinated approach. Establishing sustainable services at the institutional level requires a strong commitment from the leadership, efficient referral processes (such as electronic prompts), and committed program coordination (Watson *et al.*, 2023).

Uptake is consistently increased by standardizing referral processes, such as automatic PR referrals following hospital discharges for COPD. Institutional preparedness and scalability are strengthened by providing physical infrastructure, integrating PR into chronic disease care pathways, and training healthcare teams in PR delivery (Watson *et al.*, 2023).

The creation of a national registry in India for PR monitoring makes it possible to track referral trends, uptake, and results, offering a foundation for scaling based on data. Equity and reach are enhanced by funding mechanisms that encourage the implementation of regional programs, particularly in underserved or rural areas.

While preserving outcome equivalency, tele-rehabilitation and hybrid models increase PR access for populations that are remote or have limited mobility (Lu *et al.*, 2024). Telehealth platforms ought to be integrated into PR delivery frameworks as part of national strategies.

To align strategic priorities, resources, and public awareness, national health authorities, professional societies, and advocacy groups collaborate. Integrating PR into national frameworks for chronic diseases makes it easier to incorporate it into workforce planning, reimbursement schemes, and care standards.

Health systems can scale PR from specialized services to widely available, equitable medical offerings through multi-tiered governance, infrastructure investment, technological innovation, and stakeholder partnership.

### **6.3. Recommendations for Future Research**

#### **6.3.1. Multi-center and cross-national studies**

Multi-center and cross-national studies are necessary to advance pulmonary rehabilitation (PR) research in order to capture contextual variation across client populations and healthcare systems. The importance of comparative international designs was highlighted by a recent multicenter randomized clinical trial that compared home-based tele-rehabilitation to center-based PR in patients with severe COPD. The study found that the 6-minute walk distance was equivalent to the 12-month follow-up (Godtfredsen *et al.* 2020).

The viability of app-delivered rehabilitation at scale was also demonstrated by another multicenter randomized controlled trial that recruited patients from 18 sites in Germany and Switzerland to assess a smartphone app-based PR intervention (Rainer *et al.*, 2024).

These trials serve as an example of how standardized, extensive designs improve external validity and enable the distinction between context-specific adaptations and universal best practices. To develop globally flexible and equitable PR models, future research should compare delivery modalities and incorporate a variety of economic and health system contexts.

#### **6.3.2. Comparative studies across HCP roles**

It is crucial to conduct comparative research on the various roles that healthcare professionals (HCPs) play in pulmonary rehabilitation (PR). The impact of various provider disciplines—physiotherapists, physicians, and nurses—on referral and patient engagement

was brought to light by a qualitative study that examined HCP and patient perspectives during PR recommendation (Aldhahir *et al.*, 2022).

Based on these findings, it may be possible to customize instruction and maximize interdisciplinary cooperation by evaluating role-based differences in knowledge, attitudes, and referral practices, such as those among respiratory specialists, primary care doctors, and physiotherapists. In order to improve PR access and coordination, future cross-disciplinary research may assist in matching interventions with the distinct contributions and training requirements of each profession.

### **6.3.3. Client versus HCP perspectives**

Improving pulmonary rehabilitation (PR) requires an understanding of the differences between the viewpoints of the clients and the healthcare provider (HCP). According to a qualitative study on the needs for digital platforms, patients placed a higher priority on individualized education, crisis management support, and empowerment during care, while healthcare professionals valued information sharing and patient motivation tools (Biset *et al.* 2024).

Retention and satisfaction may suffer if clinician priorities—such as symptom control and adherence tracking—differ from customer needs, such as emotional support and self-management tools. Future studies that contrast HCP-driven clinical goals with client-reported values, experiences, and outcomes can help direct customer-centered PR design, enhance collaborative decision-making, and better match program content to customer needs.

#### **6.3.4. Longitudinal and outcome-based research**

To show the long-term effects of pulmonary rehabilitation (PR) on patient outcomes and healthcare utilization, longitudinal studies are crucial. While tele-rehab and center-based PR demonstrated comparable short-term functional gains in a randomized clinical trial, the long-term effects after a year are still poorly understood (Godtfredsen *et al.* 2020).

PR after hospitalization for COPD leads to significant lifetime cost savings and quality-adjusted life-year gains, according to health economic modeling using Markov microsimulation (Mosher *et al.*, 2022).

Future longitudinal studies, including tele-rehab and hybrid models, should monitor quality of life, cost-effectiveness, mortality, and hospital re-admissions over long periods of time. Incorporating system-level indicators, real-world data, and client-reported outcomes into these long-term assessments will produce solid proof in favor of sustainable PR funding and policy.

Several important insights about pulmonary rehabilitation (PR) and its incorporation into healthcare systems have been brought to light by the current discussion. The analysis found that healthcare professionals (HCPs) have generally positive attitudes toward PR across a number of dimensions, but that institutional barriers and ongoing knowledge gaps prevent PR from being implemented as effectively as it could be. The results showed that although most clinicians are aware of the physiological and psychological advantages of PR, increased exercise tolerance, decreased dyspnea, and improved quality of life, these advantages are not always reflected in institutional prioritization or consistent referral practices. Recurring themes that restrict program availability and sustainability were found to be staffing limitations, infrastructure difficulties, resource shortages, and inconsistent administrative support.

The significance of customizing interventions to particular institutional contexts and professional responsibilities was also highlighted by comparative analyses between healthcare systems and professional roles. The literature also highlighted the increasing importance of multidisciplinary cooperation, policy-driven frameworks, and tele-rehabilitation in removing obstacles and successfully scaling PR initiatives.

When combined, the lessons learned highlight the complexity of PR implementation, necessitating coordinated efforts at the institutional, clinical, and policy levels. It becomes clear that improving the reach and impact of PR requires a closer alignment of customer needs, provider capabilities, and systemic support structures. These realizations serve as the basis for further suggestions and future lines of inquiry and application.

#### **6.4. Contribution to business practice, policy, and research**

This conversation offers a thorough framework for enhancing pulmonary rehabilitation (PR) in contemporary healthcare, with contributions spanning practice, policy, and research. The conversation emphasizes how crucial it is to provide clinical practice-based healthcare professionals (HCPs) with sufficient training, organized referral processes, and ongoing professional development to guarantee reliable and evidence-based PR delivery. It offers practical methods for incorporating respiratory doctors, physiotherapists, nurses, and psychologists into collaborative models of care by highlighting multidisciplinary teamwork, which improves client outcomes and engagement.

The analysis makes a contribution at the policy level by highlighting the necessity of PR being accepted as a standard part of managing chronic respiratory diseases. It implies that to integrate PR into healthcare policy, institutional support, national guidelines, and economic analyses are essential. The case for ongoing funding and system-wide prioritization is reinforced by evidence of cost-effectiveness, especially in lowering hospitalizations and

enhancing long-term patient functioning. This supports international demands for fair access to PR, particularly in environments with limited resources.

The conversation highlights important research gaps that need to be filled, such as the need for cross-national partnerships, longitudinal outcome studies, and comparative evaluations across customer viewpoints and professional roles. It is necessary to conduct thorough, multicenter trials to further investigate emerging opportunities like tele-rehabilitation, digital health interventions, and personalized care pathways. The conversation offers an integrative viewpoint that views PR as a crucial, scalable, and sustainable part of managing chronic diseases rather than just an adjuvant intervention by tying together the practical, policy, and research aspects.

## **6.5. Conclusion**

The conversation concludes by restating the importance of pulmonary rehabilitation (PR) in the treatment of long-term respiratory conditions and highlighting the urgent need to remove obstacles to its wider use for a wider business expansion through a sustainable care model. Even though healthcare professionals (HCPs) generally agree that PR is beneficial, issues with institutional culture, administrative support, customer adherence, and systemic resources continue to limit its full potential, according to the synthesis of evidence. These challenges demonstrate that PR is a structural and organizational problem that necessitates a whole-system response in addition to being a clinical intervention.

The closing viewpoint highlights the need for coordinated efforts at several levels to advance PR as a novel business idea: institutions must provide resources and supportive infrastructure; policymakers must incorporate PR into health system frameworks; researchers must offer solid, evidence-based evidence to direct ongoing improvement; and clinicians must be equipped with the necessary training and knowledge. When these components are in

harmony, a path is made for PR to develop into a person-centered, universally accessible, and long-lasting model of care.

In the end, the conversation ends with the understanding that public relations are both a challenge and an opportunity. The delivery of respiratory care can be dramatically changed by addressing the obstacles noted and utilizing the facilitators mentioned. PR is a fundamental component of modern respiratory medicine because, when properly implemented, it can both lower system-wide healthcare costs and enhance the health of people with chronic respiratory disorders.

APPENDIX A  
SURVEY COVER LETTER

This questionnaire is expected to be answered only by healthcare professionals practising in India and have care opportunities for patients with Chronic Respiratory Diseases (CRDs). The objective is to understand your perspectives about Pulmonary Rehabilitation for Chronic Respiratory Disease management. It may take only 15-20 minutes to complete. Please do not take too long to answer each question. Your identity will be completely anonymous, and you will not face any consequences if you choose not to take part in the study, as it is voluntary.

There are no right or wrong answers and all responses and comments are helpful. Based on the study findings, we could improve the process of referral and patient participation for PR by understanding the enablers and barriers. The results of this survey are for research purposes only and will not impact your work in any way. Please fill it out truthfully, and thank you for your cooperation!

APPENDIX B  
INFORMED CONSENT

Please tick the following statement to participate and proceed with the survey

- I confirm that I have read and understood the above information and have the opportunity to consider the information, ask questions if needed. I understand my participation is voluntary and I may withdraw at any time without giving any reason. I agree that the information I provide can be used solely for the purpose of this research and I agree to the use of the anonymized data in publications. I understand that all personal information will remain confidential and agree to take part in this study.

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## APPENDIX A:

### Ethics Committee Approval Letter



DHR No.EC/NEW/INST/2020/886

SWH\_IEC\_18/Mr.SV/03<sup>rd</sup> November 2023

03<sup>rd</sup> November 2023

Mr. Saril V.S  
Department of Rehabilitation Medicine  
Sakra World Hospital

Dear Mr. Saril V.S  
Sub: Ethics Committee approval

Ref: Project Titled- Exploring the perspectives of Healthcare Professionals(HCP) and patients on the institutional "Pulmonary Rehabilitation" Program – a cross sectional study.

With reference to your above titled proposal submitted to IEC-SWH, the same was considered for discussion at the IEC meeting held on Friday, 03<sup>rd</sup> November 2023, at the Eagle room/Zoom platform, 7<sup>th</sup> floor at Sakra World Hospital.

The proposal, relevant documents & investigators' CVs were reviewed.

The proposal after review & discussion is approved by the members.

Kindly note:

- a) The study needs to be conducted with continual compliance to applicable statutory requirements like the ICMR National Ethics Guidelines for Biomedical Health Research and New Drugs and Clinical Trials rules 2019.
- b) The annual report needs to be filed with the Ethics Committee every 12 months from the date of this approval or completion of the study, whichever be earlier
- c) All serious adverse events need to be reported to the IEC.
- d) Change of investigator/s &/or authors need to be reported to the IEC.
- e) Changes to the title or protocol of the study need to be reported to the IEC

A copy of the project report along with the study Completion/ Final Report needs to be submitted to IEC office at the conclusion of the study.

The IEC-SWH is working in compliance with ICH-GCP guidelines, The New Drugs and Clinical Trial Rules, 2019 and ICMR guidelines and applicable local laws. This ethics committee is also registered with DHR No. EC/NEW/INST/2020/886.

Wish you the very best in your project.

Dr. Sandeep D'souza  
Member Secretary  
Institutional Ethics Committee  
Phone: 6364462390



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**APPENDIX B:**  
Survey Questionnaire

This questionnaire is expected to be answered only by healthcare professionals practising in India and have care opportunities for patients with Chronic Respiratory Diseases (CRDs). The objective is to understand your perspectives about Pulmonary Rehabilitation for Chronic Respiratory Disease management. It may take only 15-20 minutes to complete. Please do not take too long to answer each question. Your identity will be completely anonymous, and you will not face any consequences if you choose not to take part in the study, as it is voluntary.

There are no right or wrong answers. All responses and comments are helpful. Based on the study findings, we could improve the process of referral and patient participation for PR by understanding the enablers and barriers. The results of this survey are for research purposes only and will not impact your work in any way. Please fill it out truthfully, and thank you for your cooperation!

**Participant Consent**

Please tick the following statement to participate and proceed with the survey

- I confirm that I have read and understood the above information and have the opportunity to consider the information, ask questions if needed. I understand my participation is voluntary and I may withdraw at any time without giving any reason. I agree that the information I provide can be used solely for the purpose of this research and I agree to the use of the anonymized data in publications. I understand that all personal information will remain confidential and agree to take part in this study.

**Your role**

Name	
Age (years)	18-29    30- 39    40 – 49    50- 59    60 +
Gender	Female                      Male                      others (Specify)
Profession	Physician – Specify Nurse Physiotherapist Others Specify
Organization	
Practice location - state	
Do you see patients with Chronic Respiratory Diseases (CRD)?	Acute management Chronic management Both Neither
No. of years of experience	Years: .....
Do you currently refer patients with CRD to pulmonary Rehabilitation (PR)?	Yes    - If yes -                      Weekly Monthly                      Less than monthly No - if no please explain why ..... .....

**Please indicate your level of agreement with the following statements.** When rating your level of agreement with each phrase, please think about **all the things that might affect you being able to discuss PR with your patients as well as refer.**

1. For each statement, please select the answer that best suits your opinion.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe that PR is worthwhile in respiratory disease					
I believe that PR will improve patients' exercise capacity.					
I believe that PR would be beneficial in reducing dyspnea & fatigue.					
I believe that PR will improve patient anxiety and depression					
I believe that PR will improve health-related quality of life.					
I believe that PR would help in reducing hospital readmission					
I believe that PR will reduce the risk of CRD exacerbation					
I believe that PR will improve patient nutritional status					
I believe that PR will improve patient disease self-management					

2. I feel sure that I understand the eligibility criteria for pulmonary rehabilitation.

Not at all 0 1 2 3 4 5 6 7 8 9 10 Completely

3. In your opinion, what factors might influence **decision to refer** CRD patients to a PR programme?

	No influence	Some influence	Strong influence
Increasing shortness of breath			
MRC Dyspnea Scale $\geq 3$			
Mobility is affected by breathlessness			
Decreasing activity levels			
Frequent exacerbations			
Recent hospital discharge after exacerbation			
Patient is deconditioned			
Low exercise tolerance			
Patient anxiety/depression related to disease			
Poor self-management			
Easy to use referral process			
Other (Specify)			

4. In your opinion, what factors might influence your **decision not to refer** an eligible patient to PR?

	No influence	Some influence	Strong influence
I don't refer because I don't have enough information about PR			
I don't consider referring since I'm uncertain that PR is worthwhile			
I don't refer because patients have doubts that PR is worthwhile			
I don't refer because patients refuse referral			
I don't refer because patients can't attend PR due to co-morbidities			
I don't refer because patients are on supplemental Oxygen support			
I don't refer because patients do not fit acceptance criteria for a			

programme			
I don't refer because if patient has attended PR previously			
I don't refer if patient has logistic issues (transportation/distance)			
I don't refer because of lack of time to make referral			
I don't refer to PR since I'm unaware of how to refer			
I don't refer to PR because referral process is difficult			
Other (Please specify)			

5. For each statement, please select the answer that best suits your experience

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
I can see the potential value of referring patients to PR					
I believe that referring patients to PR is a legitimate part of my role					
I'm open to working with colleagues in new ways to enable PR referrals to happen					
I could easily integrate PR referral into my work					
I have confidence in the ability of colleagues who care for people with respiratory problems to refer patients to PR					
Training should be provided in my practice so that staff know who to refer to PR					
Sufficient resources would be available to support PR referral in my practice					
I would like to receive reports in my practice about the outcomes for patients following a PR referral					
The staff in my practice/ colleagues agree that referring patients to PR is worthwhile					
I am confident I could overcome any difficulties I have with regard to referring patients to PR					

6. I feel adequately prepared to refer patients to pulmonary rehabilitation.

Not at all 0 1 2 3 4 5 6 7 8 9 10 Completely

7. What interventions/ strategies would you recommend to improve the PR referral and participation in India? Tick the most appropriate. (Multiple selections possible) You may also type in your valuable ideas.

Educating clinicians – CME, Conference etc.	
Clinician referring at the time of OPD diagnosis.	
Clinician referring at the time of hospitalization / acute exacerbation.	
Patients being able to refer themselves to PR.	
Provide CRD Health Diary and tracker so they are prompted to ask for PR.	
Patient Education – provide brochures	
Patient Education- Face to face counselling	
Patient Education – using digital platform / social media	
Past PR patient / attenders counsel eligible new patients (Buddy system)	
Periodic free support group interactions	
Clinicians using motivational interviewing techniques	
Marketing - PR brochure in patient pharmacy medication packs	

Changing the name of PR to something more user friendly.	
Others (Specify)	

8. What do you think is the best way to deliver a PR for CRD population in the Indian context??

- Hospital based supervised sessions, followed by maintenance program
- Remotely supervised Virtual rehabilitation sessions (tele rehabilitation)
- Self exercises using a home exercise manual
- PR at home care with therapist visits patient home

9. What resources (Eg. tools, systems or processes) are available/needed in your practice to support clinicians in making PR referrals? Tick all that apply.

- Reminders in clinical system
- Information about PR for clinicians
- National guidelines for referral
- National registry of PR centres
- Counselling Skill training for clinicians
- If other, please give details

10. Does India need high quality PR centres?

No Need 0 1 2 3 4 5 6 7 8 9 10 High Priority

11. Availability and access to Indian PR centres in comparison with global scenario?

Not available 0 1 2 3 4 5 6 7 8 9 10 Easily available

12. Are you aware about quality and accreditation in Pulmonary rehabilitation? Yes No

If you have any queries or recommendations related to this survey, please contact Saril.V.S, Sakra Institute of Rehabilitation Sciences, Sakra World Hospital, Devarabeesanahalli, Varthur-Hobli, Bangalore, PIN 560103  
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Many thanks for completing this questionnaire.