CHAPTER I

INTRODUCTION

1.1 CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality both in developed and developing countries mainly characterized by progressive and not fully reversible airflow limitation. The common signs and symptoms of COPD are exertional breathlessness, chronic cough, regular sputum production and seasonal bronchitis with acute exacerbation. The irreversible airflow obstruction is confirmed with spirometric evaluation. Diagnosis of COPD is considered in patients over the age of 35 who have a predominant risk factor of smoking British Thoracic Society (BTS Consortium, 2004). As an important public health problem it has been the subject of many epidemiological and clinical investigations that have addressed a broad range of issues from etiology to health service utilization (Anto et al., 2001). An introductive narrative review of the epidemiological knowledge, need for pulmonary rehabilitation (PR), essential components and the benefits of PR for an effective management of COPD are detailed below.

1.1.1 Definition of COPD

Recently Celli et al. (2006) updated the standards for the diagnosis and treatment of the patient with COPD as an improved version of the earlier statements by American Thoracic Society (ATS Statement, 1995) and the European Respiratory Society (Siafakis et al., 1995). Celli et al. (2006)
defined COPD as a preventable and treatable disease characterised by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles or gases, primarily caused by cigarette smoking. Although COPD affects the lungs, it also produces significant systemic consequences.

1.1.2 Global Prevalence of COPD

Reliable COPD data are in lack for many part of the world. The World Health Organization (WHO) estimates that there are approximately 1.1 billion smokers in the world or one third of global adult population. Detailed reviews of 32 sources of COPD prevalence rate representing 17 countries and 8 world health organization (WHO) classified regions revealed that the overall prevalence in adult appears to lie between 4% -10%, (Halbert et al., 2003). The national center for health statistics estimate that COPD affects more than 16 millions US population, (National center for health and statistics, 1998). Jindal et al. (2006) estimated that in India the median value of different prevalence rates among COPD patients are male 5% and female 2.7%.

The third National Health and Nutrition Examination Survey (NHANES III) estimate the prevalence of 1.5 million person with COPD in Spain, 3.0 million person in UK, 2.7 million person in Germany, 2.6 million person each in Italy and France (Stang et al., 2000). The burden of COPD among the elderly population in Europe, and worldwide are increasing. Population based study for the last two decades by Dutch programme indicated that 4-6% of the adult population suffers from clinically relevant COPD. The prevalence of COPD in some selected countries of the world is given in Table 1.1.
1.1.3 Prevalence of COPD in India

Ongoing rapid industrialization and urbanization in India result in mushrooming human settlements in thickly populated and polluted areas. This process causes an increased incidence in COPD. It was estimated to be about 18% of urban adult population and 14% of rural adult population suffer due to respiratory dysfunction. Kamat (1984) predicted that, in India, the overall prevalence of COPD by 2000 could be about 3.8%. Recently, Jindal et al. (2006) estimated that in India the median value of different prevalence rates among COPD patients are male 5% and female 2.7%. Increased incidence, prevalence and mortality figures are expected to increase early in the 21st century, particularly in developing countries such as China and India, but the burden of COPD in developed countries is expected to remain substantial, (Niu et al., 1998).

1.1.4 Is COPD Gender Specific?

Prevalence of COPD increases heavily with age, the recent surveys have shown only small difference or narrow gap between males and females, (Lundback et al., 2003). Among the total of 50714 incident COPD patients studied, 23277 (45.9%) of them were women. The prevalence rate of COPD in UK seem to have peaked in men, they are continuing to lead women. This gender related difference might probably be due to differing patterns in tobacco use. However in developed nations the increased habit of smoking among women narrows down the difference (Soriano et al., 2000).

1.1.5 Risk Factors of COPD

Chronic obstructive pulmonary disease (COPD) develop when the age related losses in pulmonary function exceed the normal expected losses by a
considerable margin. It is now clear that COPD does not have a single cause and that multiple factors must act in concert for the disorder to become clinically evident.

Even though the cigarette smoking is the principal identified risk factor in the causation of COPD there are some other risk factors also contribute for the development of COPD. A number of occupational exposures and residing in more polluted regions appear to be associated with some added risk for developing COPD. The exposure to coal, fine silica, dust, smoke, fume, husk, cotton and poisonous gas results in onset of COPD in miners, fire fighters, grain handlers, smelters, and industry workers also develop COPD (Jindal et al., 2006).

**Table 1.1 Prevalence of COPD**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Country</th>
<th>% Prevalence</th>
<th>% Prevalence</th>
<th>Reference</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Adult &gt; 40 Yrs</td>
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<tr>
<td>1</td>
<td>Australia</td>
<td>-</td>
<td>3.5</td>
<td>3.6</td>
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<tr>
<td>2.</td>
<td>China</td>
<td>2.5</td>
<td>2.6</td>
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<tr>
<td>3.</td>
<td>India</td>
<td>3.9</td>
<td>5.0</td>
<td>2.7</td>
</tr>
<tr>
<td>4.</td>
<td>Italy</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Japan</td>
<td>-</td>
<td>5.8</td>
<td>3.1</td>
</tr>
<tr>
<td>6.</td>
<td>Sweden</td>
<td>2.1</td>
<td>2.7</td>
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<td>7.</td>
<td>U. K</td>
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<td>4.0</td>
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</tbody>
</table>

O - Overall;  M - Male;  F - Female
In some underdeveloped and developing countries like India the domestic smoke in houses because of the biomass fuel such as wood for cooking and huts without chimneys contribute to chronic bronchitis particularly in developing countries and rural areas affects women. The extreme levels of air pollution, particularly those associated with high concentration of particulate matter and SO\textsubscript{2} are clearly the causes of COPD (Baum & Wolinsky, 1994). Silverman et al. (1989) investigated the hereditary factors on COPD and concluded that alpha 1 antitrypsin deficiency might develop chronic airflow obstruction.

1.1.6 Avoidance of Risk Factors

In developed countries efforts to initiate preventive measures such as tobacco and smoking cessation program both for men and women is essential. In developing countries efforts to promote cleaner fuels, improve stoves, better home ventilation, reduce toxic dust and fume exposure, compact infectious disease like Tuberculosis or HIV, and improve the nutritional status are the ways by which lung health of a person can be improved (Varkey, 2004).

1.2 ILL EFFECTS OF COPD

Chronic obstructive pulmonary disease (COPD) has become increasingly important cause of morbidity and mortality in the modern world (Pauwels et al., 2001; Ries, 1997). Globally about 2.9 millions adults die each year due to COPD and it ranks 5\textsuperscript{th} cause of mortality world wide (Soriano et al., 2000). In addition to the mortality, COPD causes ill effects of disability, impairment and handicap for the individual concerned. COPD also causes a societal cost due to loss of productive work hours, cost of health care etc. Yelin et al. (2006) conducted a survey on work life of persons with
various respiratory diseases and found that at the age of 55 only 62% of persons with COPD continued to work whereas 72-78% of persons with asthma and rhinitis continued their work. In India respiratory dysfunction continues to be a major health problem, since a complex mix of socioeconomic and environmental factors such as poverty, malnutrition, illiteracy and air pollution, is prevalent (Park, 2000). In India about 32% of smokers and 6% of non-smokers suffer from COPD (Jindal, 2006). A prospective survey on 4129 subjects in three urban and rural communities in India indicates that about 18% of the urban population and about 14% of the rural population suffers due to respiratory dysfunction (Kamat, 1984).

1.2.1 Disability of COPD

Chronic obstructive pulmonary disease is one of the growing cause of disability. In 1990, COPD was the 12th most burdensome condition in the world. According to the projection from 1990, WHO Global burden of disease study, COPD will rank 5th in 2020, being responsible for Disability Adjusted Life Years (DALYs) lost after the Ischaemic heart disease, major depression, traffic accidents and cerebro vascular disease which cause a greater burden (Murray & Lopez, 1996).

COPD is a broad classification of disorder including chronic bronchitis, and emphysema. It is a condition associated with dyspnoea on exertion and reduced airflow in or out of the lungs. COPD is the disease which predominantly affects the older age group and make the person disabled in the following aspects like breathe, eat, bathe, groom, toilet, move about and communicate (Delisa & Bach, 1996).

Marked increase of occupational morbidity related to the broncho-pulmonary disorders in Ukraine, where an increase in occupational diseases is
observed mainly in mining and smelting plants. Occupational pulmonary diseases have long asymptomatic period and are diagnostically revealed at the late stages. It leads to stable disability and early mortality of those patients. Timely prophylactic and rehabilitation measures directed to the workers are highly important issue nowadays (Vil’ians’ka & Rodionova, 2006).

For patients with pulmonary impairment, disability can be due to contractures of muscles/tendon or muscle dysfunction, low endurance, primary skeletal or cardiopulmonary pathology, other associated disease pathology or some combination of impairments. The patients can be handicapped further by architectural barriers, public policies and inadequate finances, lack of family support or education. Therefore, for rehabilitation to be successful the rehabilitation professionals mainly the nurses must identify and differentiate the disease process, impairments, disabilities and handicaps so that the remedial strategies can be determined.

1.2.2 Mortality of COPD

In 1990, the World Health Organization (WHO) Global burden of disease study showed that the COPD was the 6th leading cause of death worldwide. At present COPD ranks 5th cause of mortality, (Soriano et al., 2000). By 2020, COPD is expected to rise to the third position, after ischaemic heart disease and cardiovascular disease. The WHO and World Bank, in 1990 reported that COPD caused 4% of deaths (>2 million) worldwide, by 2020, this figure is projected to rise to 7% (4-5 million). An increased mortality rate from COPD among lower socio economic groups is observed consistently (Murray & Lopez, 1996).
1.2.3 Economic Impact of COPD

COPD not only affects the concerned individual, it also causes a considerable damage to the nation economy (Faulkner & Hilleman, 2002; Ruchlin & Dasbach, 2001). It has been estimated that in France the direct cost (health care cost alone) of COPD per patient per annum is 530 Euro, whereas the societal cost is estimated to be about 2900 Euro (Piperno, 2003). In Canada, the direct cost of COPD is about 1200 C$ per patient and the societal cost is about 3200 C$ (Chapman, 2003). In USA the societal cost of COPD per annum is estimated to be 9.9 billion US$ (Sin, 2002). In Sweden the estimates indicate an amount of 3 billion SEK as cost per annum, which works out to be approximately 2% of the economic cost of all diseases (Jacobson, 2000). It could be inferred from various studies on economic burden of COPD that the societal cost is about 3 to 5 times of the direct health care cost. Therefore it becomes essential to evolve a suitable and workable programme to control the ill effects of COPD on an individual and to the society.

1.3 PULMONARY REHABILITATION

1.3.1 Definition

Pulmonary rehabilitation (PR) is defined as a multidisciplinary programme of care for patients with chronic respiratory impairment that is individually tailored and designed to optimize each patient’s physical and social performance and autonomy (BTS Statement, 2001).

1.3.2 Scope of Pulmonary Rehabilitation

The aim of PR is to reduce disability and handicap in people with lung disease and to improve their quality of life while diminishing the health care
burden. WHO emphasised that the outcomes assessment of PR should incorporate the impairment, disability, and handicap assessment criteria. There is now strong scientific evidence to recommend the application of PR programmes that comprises of physical training, education, dietetics, occupational therapy, psychology, and social support. The benefits include improvements in exercise performance, health status, dyspnoea, and reduction in usage of health services. Other potential advantages are suspected but yet unproven. Summaries of the scientific evidence and recommendations for practice have recently been published by the American Thoracic society and in the American College of Chest Physician / American Association of Cardio Vascular and Pulmonary Rehabilitation ACCP/AACVPR evidence based guidelines (Ries et al., 2002).

1.3.3 Goals of Pulmonary Rehabilitation

The goals of PR are

- To reduce the symptoms, disability, and handicap and
- To improve functional independence in people with lung disease.

1.3.4 Benefits of Pulmonary Rehabilitation

PR leads to clinically meaningful improvements in health related quality of life, functional exercise capacity and maximum exercise capacity. Eight weeks programme of PR reduces dyspnoea, maintains improvements in exercise capacity and health status for up to six months, however these benefits are not sustained at one year. The magnitude of the effects of PR on exercise capacity, dyspnoea and health related quality of life (HRQOL) are significantly greater than the effects of bronchodilator drugs.
1.3.5 Setting and Duration of Pulmonary Rehabilitation

Traditionally PR courses have been run in secondary care settings, usually in an outpatient or inpatient basis in countries outside the UK. Recently community based programmes have also been developed. There is good evidence on the content of the programme, but less information on the optimum duration or comparative efficacy in different settings.

PR programmes should include multi component, multi disciplinary interventions, which are to be tailored to the individual patient’s needs. The rehabilitation process should incorporate a programme of physical training, disease education, nutritional, psychological, and behavioural intervention (Clark, 1994). Smoking cessation in patients with COPD is the single most important intervention that slows the rate of decline in FEV₁ with consequent benefits in terms of progression of symptoms and survival. Patients should be made aware of the benefits of PR and the commitment required to gain these. PR should be offered to all patients who consider themselves functionally disabled by COPD.

1.3.6 Pulmonary Rehabilitation as a Therapy

Pulmonary rehabilitation (PR) is an increasingly popular and effective option widely used for patients with moderate to severe COPD as a therapy. Rehabilitation aims to prevent deconditioning and allow the patient to cope with their disease (Bellamy et.al, 2006). Probably the first literature on PR, Nicholas et al. (1970) and Haribass et al. (1970) emphasised the need for combining education, exercise training, chest physiotherapy techniques and psychosocial support for effective PR. Most PR programmes are hospital based and comprise individualized exercise programmes and educational components. PR has been available in North America and Europe for some
years, but availability is still limited in the UK. In most of the countries of Asia and Africa suitable PR programmes are yet to be evolved and administered to COPD patients. Individual programmes differ in the precise exercises used, are of different duration, involve variable amounts of home exercise and have different referral criteria. There is growing interest to organize rehabilitation programme in community setting may be easier for patients to attend.

McDermott (2002) observed that PR is not a well-recognised therapy for patients with COPD in the UK. However, many studies have been conducted on PR and the results support, its effectiveness and benefits in improving quality of life for COPD patients. Although pulmonary function generally does not change, exercise tolerance can improve, together with decreased symptoms of breathlessness, improved quality of life and less need for health care services. Patients are empowered with a better understanding of their disease and the proper usage of medication, oxygen therapy and chest physiotherapy techniques. Thus the authors assured that PR was helpful as adjunctive measures to maximize the functional capacity of COPD patients, (Resnikoff & Ries, 1998).

Non pharmacological treatment of COPD such as smoking cessation, rehabilitation, long term oxygen therapy and noninvasive positive pressure ventilation are real option to successfully treat these patients and prevent further deterioration (Clini et al., 2003).

1.4 ASSESSMENT OF PULMONARY REHABILITATION

The individual assessment of patients and evaluation of programmes is embedded in the process of rehabilitation. Outcomes can be informally
classified into the WHO categories of impairment, disability, and handicap (BTS Statement, 2001).

1.4.1 Impairment Measurement

Impairment of lung function does not reverse with rehabilitation, although its measurement may be important to describe the population. Skeletal muscle dysfunction and nutritional status are secondary measures of impairment and capable for improvement. Peak oxygen uptake and dyspnoea during maximal exercise is also a measure of physiological impairment. The GOLD standard measure is a laboratory exercise test on either a treadmill or cycle ergometer. A symptom limited maximal test has been shown to be sensitive to change following rehabilitation where an increase in VO₂ peak of approximately 15% has been reported.

1.4.2 Disability Measurement

Disability can be pragmatically assessed by testing functional capacity with a field based exercise test such as the timed 6 minute walk test (6MWT) or a shuttle walk test (SWT, incremental or endurance). One difficulty with the interpretation of studies that have used timed walking tests has been the lack of standardization that may have led to factitious improvement. A change of 54 meters has been suggested to be the minimum need for clinical significance in a properly conducted 6MWT. A similar value for the incremental SWT has not yet been identified, although changes in the region of 30–55% have been reported following rehabilitation. A test of endurance shuttle walking capacity is even more sensitive to change. A measure of dyspnoea or fatigue (Visual Analog Scale or Borg) alongside exercise testing should be considered to increase the sensitivity of exercise measurements.
1.4.3 Handicap Measurement

Handicap, or the social impact of disease, can be assessed using health status measures. General measures have been employed such as the Short Form-36 (SF-36) or Quality of Well Being Scale (QWB) which demonstrate less sensitivity than disease specific questionnaires but have value for cross disease comparisons and health economic analysis. The Chronic Respiratory Questionnaire (CRQ) is consistently sensitive to change and clinically significant levels of change have been published. It has also become clear that measures which appear to be less sensitive, such as the St George’s Respiratory Questionnaire (SGRQ), may in fact be more durable once clinically important change is achieved. In the absence of maintenance rehabilitation therapy, this change may confirm a genuine change in lifestyle. Most health status measures encompass aspects of impairment, disability, and handicap. Only one questionnaire, the Psychosocial Adjustment to Illness Scale-Self Report (PAIS-SR), which measures the handicap alone by examination of the psychosocial adjustment to illness, has been applied in the context of PR. The choice of questionnaire as outcome measure may also be influenced by the ease of use. The CRQ is easy to score but currently may take 20 minutes to administer, while the SGRQ is nominally self administered but has more complicated scoring.

1.4.4 Perception Differs on Outcome Measures of PR

The central aim of rehabilitation is to increase function, and there are an increasing number of questionnaires of functional status in this field for example, the Pulmonary Functional Status Scale (PFSS) and Pulmonary Functional Status and Dyspnoea Questionnaire (PFSDQ) but their sensitivity to change following rehabilitation has only undergone limited study. Some argue that information on function is already included in some of the disease
specific health status measures and additional questionnaires are unnecessary. As domestic independence is an important goal of rehabilitation, this should be reflected by standardised activity of daily living (ADL) scales. People with chronic respiratory disease may, however, have different challenges to those with other disabilities, so two disease specific ADL scales have recently been reported for use in chronic lung disease. One further development has been the use of physical activity monitors to record general levels of domestic movement.

1.4.5 Health Need and Further Development

Traditional treatments of COPD are useful in symptomatic control, but do not prevent the prognosis of the disease. Current therapies address the symptoms and range from bronchodilators, corticosteroids to oxygen. There are no effective cures and no single diagnostic test for COPD. Diagnosis relies on a combination of history, physical examination and confirmation of the presence of airflow obstruction by lung function testing with Spirometry (Kaplan et al., 2004).

The scientific exploration of PR has only just begun, but research has already had an immediate impact on clinical practice. Many questions remain unanswered concerning the optimum format, conduct, and delivery of programmes. The complete impact of rehabilitation on the lives of patients and their relatives is largely unexplored and the health economic issues are currently being addressed. Understanding of the nature of disability in lung disease has improved by altering the focus away from the lung to the skeletal musculature with the promise that other methods of enhancing physical performance in addition to physical training may be effective.
There are now strong arguments for the widespread development of PR services. The prevalence of disability due to chronic respiratory disease is high. PR is a safe, effective, and the inexpensive interventions may reduce health service usage and is popular with patients and clinicians alike. The need for the services, the demands for rehabilitation are substantial, while the capacity to supply rehabilitation services are poor. To improve the situation, action from consumers, health professionals, and even commissioners of health care will need to be stimulated, but the evidence already exists to justify immediate investment in pulmonary rehabilitation services for patients with chronic lung disease (BTS Statement, 2001).

1.5 MULTI DIMENSIONAL PULMONARY REHABILITATION

Pulmonary rehabilitation (PR) is a multidimensional continuum of services directed to persons with pulmonary disease and their families, usually by an interdisciplinary team of specialists, with the goal of achieving and maintaining the individuals maximum level of independence and functioning in the community (Sharma, 2001).

PR combines exercise training, behavioral and educational programmes designed to help patients with COPD to control symptoms and improve day to day activities. It is a team approach; patients work closely with their doctors, nurses, respiratory, physical, occupational, exercise specialist, psychologist and dietician (Ries, 1997).

According to Celli (1995, 1997) the main goals of PR are to

i) Reduce and control breathing difficulties and other symptoms.

ii) Learn more about the disease and the treatment option and coping strategy.
iii) Learn to manage the disease, reduce the dependence on the health professional to reduce the utilization of costly medical resources.

iv) Maintain healthy behaviors such as smoking cessation, good nutrition and exercises to improve health related quality of life (HRQOL) and survival.

1.5.1 Conventional Therapy of COPD

Conventional physiological and psychological intervention in PR include

- Smoking cessation
- Administration of Oxygen
- Patient education
- Breathing exercise and
- Physical exercise conditioning

1.5.2 Current Therapy of COPD

Recently the statements of American, British Thoracic Societies and several researchers have indicated the need for a detailed investigation on the effect of education, exercises and psychosocial support in pulmonary rehabilitation (ATS Statement, 1999; BTS Statement, 2001; Piquette, 2001; Worth, 2002; BTS COPD consortium, 2004).

1.5.3 Multi-Disciplinary Team Members

According to National Institute for Clinical Excellence, doctors, nurses and physiotherapists are essential members of the multi-disciplinary team of
managing patients with COPD (BTS COPD consortium, 2004). In more severe COPD the multidisciplinary team include an occupational therapist, dietician, social worker, mental health trained worker, behaviour nurse therapist, clinical psychologist or liaison psychiatrist. These individuals may fulfill a variety of roles including those listed below. Many of these activities may be undertaken in the clinic or in the practice as part of routine care by the practitioner, but in certain circumstances the patient may need to be referred to a specialist department e.g. physiotherapy. Multi-disciplinary approach breaks down historic demarcation of roles. Competencies are more important than professional boundaries.

1.5.4 Activities of Multidisciplinary Rehabilitation Team

The activities of multidisciplinary rehabilitation team towards patients with COPD are to

- Perform spirometric assessment.
- Assess the need for oxygen, activities of daily living and inhalation therapy.
- Manage patients if necessary with noninvasive ventilation, pulmonary rehabilitation (PR) hospital/ home.
- Identify and manage anxiety and depression.
- Educate patients on relaxation techniques, dietary issues, exercises and self management strategies.
- Monitor patients at high risk of exacerbations.
- Educate other professionals on PR.

The nurses are usually the main point for the patients and their families and as such provide them with a link to the multidisciplinary team. The
evolving role of the nurse in the field of chest medicine is not just to provide
drug management but also in other therapeutic and supportive interventions.
All of the above mentioned activities are hidden in routine nurses role.

1.6 ROLE OF RESPIRATORY NURSE SPECIALIST

COPD specialist nurses are found both in the primary and secondary
care settings. Their role varies from place to place depending on local
circumstances. But there are some common roles as follows.

1.6.1 Educator

Education of patient and their care provider is the key role of the
nurses. Nurses often have more time to spend with patients and their care
provider than doctors. The patients may feel less inhibition about asking
questions or showing their lack of understanding. Apart from patient care, the
nurses educate other professionals caring for COPD patients through formal
and informal education sessions on use of spirometry and early detection of
COPD.

1.6.2 Self Management of Exacerbations

Preparation of COPD patients for self management plans is concerned
with guiding responses to subtle day to day variations in symptoms and lung
function. Self management plans in COPD are designed to enable patients to
respond appropriately to the first signs of an exacerbation and are not
concerned with insignificant day to day variations in symptoms. If practiced
correctly, the self management plans will often help patients to start courses
of antibiotics or oral steroids that they have been given to keep at home and
may lead to reduced hospital admissions. The main aim of self management is
to prevent exacerbations by life style adaptation and to allow patients to acquire the skills to treat their exacerbation at an early stage. This can be achieved either by self management education and/or self management plans. A self management plan was defined as a plan (either written or verbal) designed with the primary purpose of patient self management of COPD exacerbations. The plan guides the patients in the event of COPD exacerbation to start or adjust their medication (BTS COPD consortium, 2004).

1.6.3 Co ordinator

- Main point of contact for patients and their families.
- Provides link to the multidisciplinary team.
- Refer patients to other professionals e.g. dietician, social services.

1.6.4 Care Provider in Hospital

- Assess and monitor the COPD patients through spirometry, oxygen saturation and symptom measurements e.g. the BORG breathlessness scale.
- Provide psychological and emotional support for the patient and their family.

1.6.5 Home Care Provider and as a Respiratory Nurse Consultant

- Provide home care both for the stable COPD and during exacerbation.
- Assess and monitor patients on long term oxygen therapy (LTOT).
• Assess of oxygen saturation levels, spirometry and symptom measurement.
• Monitor patients on home ventilation.
• Manage exacerbation effectively, if required refer to hospital.
• Identify and manage anxiety and depression.
• Prescribe and allow the patient’s to adjust treatments according to their needs.

Evolving nursing role is further more, not just in drug management but also in other therapeutic and supportive interventions. Respiratory nurse specialists form the important part of the multidisciplinary team to manage patients with COPD. Their role within the multidisciplinary team will vary depending on local circumstances and individual competencies.

1.7 NEED FOR THE STUDY

Currently it has been almost established that the functional abnormalities observed in COPD patients are largely irreversible. The damaged lung will continue to exhibit usual aging losses in function even though no further injury is sustained. Thus the best, one might hope to achieve through rehabilitation is bringing down the loss of FEV$_1$ of the patients with COPD to the normal loss rate of 25 to 30 ml per year in comparison to a loss rate of 50 to 100 ml per year in an un rehabilitated condition (Baum & Wolinsky, 1994). The effect of pulmonary rehabilitation in improving the survival of patients with COPD is clearly indicated in Figure 1.1.
A man of 50 years age (X) has mild COPD with an FEV\textsubscript{1} of 1.5 liters/sec. If he continues to sustain annual FEV\textsubscript{1} losses of 100 ml/year, death is likely within 10 years (A). However, if by therapeutic intervention and pulmonary rehabilitation, annual FEV\textsubscript{1} losses revert to normal (27 ml/year), death from COPD is unlikely to occur for at least 30 years (B).

However few studies indicate the possibility of partially restoring the elastic lung recoil. Bogaard et al. (1995) examined the lung elasticity in patients with COPD and found that patients with moderate obstruction had no appreciable loss of elastic lung recoil as compared with healthy individuals.
Tiwary et al. (1989) and Yan and Sun (1996) investigated the effect of breathing exercises on patients with COPD and found a significant improvement in vital capacity and maximum expiratory pressure respectively. Recently several researchers have indicated the need for a detailed investigation on the effect of education and psychosocial support in PR (Postma et al., 1999; Piquette, 2001; Worth, 2002). Hence it is worth investigating the effect of multidimensional PR incorporating breathing / physical exercises and psychosocial support on the pulmonary functional measures, 6MWD and HRQOL.

1.7.1 Pulmonary Rehabilitation Scenario in India

In India the pulmonary rehabilitation (PR) for patients with COPD is not well established. Recently, Jindal et al., (2004) released guidelines for management of COPD in India, in which the need for PR has been indicated. The patients with COPD who got admitted in hospital or consulting the chest physician are mainly subjected to medical management and provided with some unstructured information regarding the disease, coping strategy, diet and breathing / physical exercises. Neither the caregiver nor the patients have an adequate knowledge on the benefits of multidimensional PR, whereas in many of the developed countries the patients are subjected to multidimensional PR (Delisa & Bach, 1996).

1.7.2 Twin Significance of the Study

A study on multidimensional PR of patients with COPD is important on two accounts namely scientific and social needs. In this context, the investigator realised the social need and felt that it would be appropriate and beneficial to study the effect of a simple easily practicable Multidimensional Pulmonary Rehabilitation Programme. In one hand the findings of the study will be
useful to validate the benefit of multidimensional PR. On the other hand the increased incidence of COPD in recent years necessitate the evolution of a suitable multidimensional therapy inclusive of patient education, physical and breathing exercises and psychosocial support. Hence it was felt that a study on the effect of home based multidimensional PR comprising of physical exercise, breathing exercise, education and psychosocial support on the pulmonary functional measures (PFM), six minutes walking distance (6MWD) and health related quality of life (HRQOL) would be appropriate and beneficial for patients with COPD.

It is essential to use a sensitive, suitable and administrable HRQOL instrument to measure the changes in subjective well being of COPD patients who underwent PR. Due to wide variation in social, economical, cultural and educational status of people from country to country, usage of one universal instrument to measure the subjective well being is non practicable. Therefore it becomes essential to develop an appropriate instrument based on the guidelines and salient features of established HRQOL instruments such as Chronic Respiratory Questionnaire (CRQ) and St George’s Respiratory Questionnaire (SGRQ).

1.7.3 Theory Basis

The nursing theory chosen as the basis for the present study is Orem’s self care deficit nursing theory. The applicability of this theory for the study is given in 2.8 & 2.9.

1.8 STATEMENT OF THE PROBLEM

A randomised controlled trial to evaluate the effectiveness of physical, breathing exercises and exercise with psychosocial support on pulmonary functional measures, six minutes walking distance and health related quality of life of patients with chronic obstructive pulmonary disease.
1.9 OBJECTIVES OF THE STUDY

The specific objectives of the research study are to

1. Determine the effectiveness of physical and breathing exercises on pulmonary functional measures (PFM), six minutes walking distance (6MWD) and health related quality of life (HRQOL) in exercise group.

2. Evaluate the effectiveness of physical and breathing exercises with psychosocial support on pulmonary functional measures, six minutes walking distance (6MWD) and health related quality of life (HRQOL) in exercise with psychosocial support group.

3. Compare between the effect on pulmonary functional measures, 6 MWD and HRQOL scores at the end of the first and second month of pulmonary rehabilitation in control, exercise and exercise with psychosocial support groups.

4. Find the correlation between the pulmonary functional measures, 6 MWD and HRQOL scores.

5. Identify the association between the demographic variables and COPD.
1.10 RESEARCH HYPOTHESES

**H1.** Practice of physical and breathing exercises improve pulmonary functional measures, six minutes walking distance (6MWD) and health related quality of life (HRQOL) of patients with COPD than those who do not practice physical and breathing exercises

**H2.** Practice of physical and breathing exercises along with psychosocial support improve pulmonary functional measures, six minutes walking distance (6MWD) and health related quality of life (HRQOL) of patients with COPD than those who do not receive psychosocial support

**H3.** There is an association among pulmonary functional measures, health related quality of life (HRQOL) scores and six minutes walking distance (6MWD).

1.11 OPERATIONAL DEFINITIONS

1.11.1 Multidimensional Pulmonary Rehabilitation

Multidimensional Pulmonary Rehabilitation is defined as combination of breathing exercises, physical exercises and psychosocial support.

1.11.2 Physical Exercises

Physical exercises refer to the combination of upper extremities exercises (wall hand climbing, rod lifting, rope turning and pulley tugging) and the lower extremity exercise (walking).

1.11.3 Breathing Exercises

Breathing exercises refer to the combination of pursed lip breathing exercise, diaphragmatic breathing exercise, balloon blowing and water bubbling.
1.11.4 Psychosocial Support

Psychosocial support refers to activities related with patient and family education, weekly telephonic call and fortnight home visit in order to motivate the COPD patients to follow the schedule of multidimensional pulmonary rehabilitation.

1.11.5 Pulmonary Functional Measures

Pulmonary functional measures (PFM) refer to parameters such as forced vital capacity (FVC), forced expiratory flow rate (FEV₁), the ratio (FEV₁/FVC), and peak expiratory flow rate (PEFR).

1.11.6 Health Related Quality of Life

Health related quality of life (HRQOL) refers to the abilities related with breathing, physical, daily activities, social and emotional aspects.

1.12 ASSUMPTION

Adequate physical, breathing exercises and psychosocial support will improve the pulmonary function, six minutes walking distance and health related quality of life of patients with COPD.

1.13 LIMITATIONS

1. Only two settings were selected for the study
2. Exercise capacity was assessed only by six minutes walking distance
3. Health Related Quality of Life was evaluated by newly prepared interviewer led questionnaire
4. Mid assessment of pulmonary functions and the inclusion of other measures such as treadmill test, cycle ergometry, VO₂ max and ABG analysis could not be performed due to economical constraints.

1.14 PROJECTED OUTCOME

This study is conducted to determine the effects of physical, breathing exercises and psychosocial support on pulmonary functional measures, exercise capacity measured in terms of 6MWD and HRQOL. The results of the study will enable the nurses / health professionals to utilise these techniques in the hospital / home settings as an additional intervention to relieve dyspnoea and to improve HRQOL. Many patients who live with breathing difficulty can be taught the importance of physical and breathing exercises and psychosocial support to minimise the level of dyspnoea and to improve HRQOL.