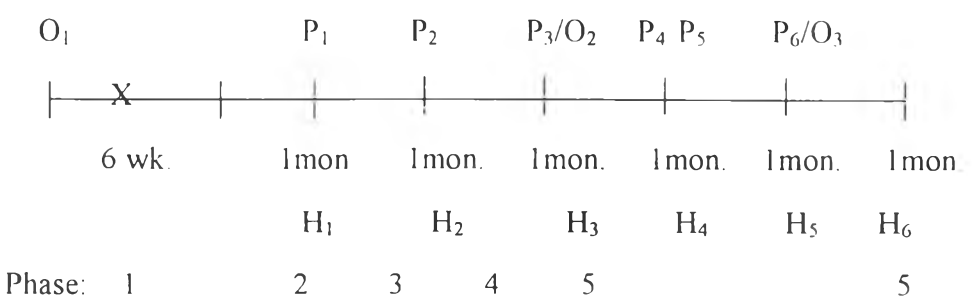
CHAPTER III

PROJECT EVALUATION

3.1 Introduction

In order to determine the pulmonary rehabilitation program's effectiveness, this project evaluated each phase of the rehabilitation program which composed of 5 phases as illustrated in Figure 3.1 below. Detailed description and findings of each evaluation phase may be found in section 3.2.

Figure 3.1 : Overview of Program Evaluation



Note: X = Pulmonary rehabilitation program

O_1 = Baseline or pre intervention in the study group

O_2 = Post intervention 3 months in the study group

O_3 = Post intervention 6 months in the study group

P_1 ,P_2 P_3 P_4 ,P_5 P_6 = To conduct 6 consecutive home visits in the study group with one month interval basis.

H_1 ,H_2 H_3 H_4 ,H_5 H_6 = To conduct hospital follow-up care in the hospital with one month interval basis.

Figure 3.1 may be summarized as follows:

Phase 1. Baseline (**O**): The project team collected the demographics data of each patient. (Appendix1) In addition, baseline information on specific health measures before the participation in the program were recorded using the three standard instruments that assess health outcomes in patients with chronic respiratory disease. They were The Chronic Respiratory Questionnaire (CRQ), the 12- minute distance walk test (12MD) test and the Horizontal Visual Analogue Scale (HVAS). Examples may be found in Appendix 2, 3, and 4.

Phase 2. The rehabilitation training program in the hospital by the pulmonary rehabilitation team (**X**): The 3- hour's sessions offered once a week over a 6- week period classes in the hospital were organized for the study group and evaluated based on the training content, appropriateness with the participants, timing, and resource allocation. The data collection instruments used in this evaluation process involved observation and informal interview. (Appendix 5)

Phase 3. Home-based rehabilitation and home visits ($\mathbf{P_1,P_2,P_3,P_4,P_5,P_6}$): Home visit program was conducted by the project assistant that involved 6 monthly visits. The main purpose was to follow-up and to reinforce self-care behavior of the study group. This phase evaluated the effect of home visits, in terms of, benefits to the subjects and the ability of the subjects in applying what they learned at the training program in the hospital to the patients' own situation. Both qualitative and qualitative data were obtained using in-depth interview, observation (Appendix 6), and home visit records.

Phase 4. Hospital follow-up care in the hospital (H_1, H_2 H_3 H_4 H_5 H_6): Two types of data collection methods were used to evaluate of the effectiveness of hospital follow-up care on the compliance rate and the symptoms of COPD that the patients report in this phase. (Appendix 7)

Phase 5. Post intervention (O_2, O_3)**:** Two evaluation sessions were conducted to assess the overall effectiveness of the program, with first evaluation at three month and second evaluation at six month after the completion of the intervention phase. The data collection methods in evaluating three main outcomes of the program included The Chronic Respiratory Disease Questionnaires, the 12- minute distance walk test, and the Horizontal Visual Analogue Scale.

3.2 Evaluation Phase

Phase 1: Baseline (O_1)

Purpose

1. To evaluate general characteristics of the study group.
2. To evaluate the quality of life, the exercise capacity and the perception of dyspnea of the study group before intervention to serve as a baseline information.

Evaluation Question

1. What are the general characteristics of the participants?

2. *What are the levels of the quality of life, the exercise capacity and the perception of dyspnea of the COPD patients before participating in the rehabilitation program?*

Evaluation Design

1. The evaluation was conducted 1 day before beginning the hospital base pulmonary rehabilitation program, the subjects completed the Chronic Respiratory Disease Questionnaires (CRQ), the 12-minute distance walk test (12MD) and the Horizontal Visual Analogue Scale (HVAS). Data obtained at this phase served as baseline for comparison after the completion of the intervention program.
2. Outcome measurements were
   - General data
   - Mean scores of the quality of life, the exercise capacity and the perception of dyspnea.
3. Data collection instruments were
   - General Questionnaire.
   - The Chronic Respiratory Disease Questionnaires (CRQ).
   - The 12-minute distance walk test (12MD)
   - The Horizontal Visual Analogue Scale (HVAS).
4. Data collection
   - Quantitative data were obtained by having each COPD patients provide demographic information 1 day before the subjects entered the

rehabilitation program. The data were used to provide general background and risk factors of the subjects.

- The team manager using the Chronic Respiratory Disease Questionnaires (CRQ) interviewed all 13 COPD patients.
- All subjects performed the 12-minute distance walk test (12MD) and completed the Horizontal Visual Analogue Scale (HVAS) after exercise.

5. Data analysis
   - Descriptive statistics were used to describe the group of characteristics.
   - Frequency and standard deviation values were obtained to describe general data, the quality of life, the exercise capacity and the perception of dyspnea at preprogram.

Results

1. Patients Characteristics

Demographics characteristics of the 13 COPD patients are provided in Table 3.1

Table 3.1: PATIENTS CHARACTERISTICS

Characteristics		number
Gender		
Male		11
Female		2
Age, yrs, mean(SD)	range 42 - 78 years	60 (8.8)
The age groups		
40 -50 years		2
51-60 years		5
over-61 years		6
Marital status		
Married		12
Single		1
Education		
Grade 4		7
No formal education		6
Occupation		
Agriculture		12
Household worker		1
Smoking habits		
Previously a smoker		10
Presently a smoker		2
Never smoke		1

Characteristics	number
FEV1/FVC, mean % (SD)	60.28 %, (13.71)
Severity of disease	
Mild airway obstruction	10
Moderate airway obstruction	1
Severe airway obstruction	2
Duration of illness	
Less than 1 year	2
1 year to 5 years	6
Up 5 years	5
Relationship with Caregiver	
Wife	8
Daughter	4
Self-care	1

From Table 3.1 the results showed:

Gender. Of the 13 participants, 2 were female and 11 were male.

Age. The age range of the subjects was 42 to 78 years by the mean age of 60 years.

Marital status. The majority of 12 subjects were married and 1 was single.

Main occupation. The main occupation of the 12 subjects was agricultural and 1 was a household worker.

The educational level. Seven of the 13 subjects had had at least primary school education and 6 had not had any formal education.

Smoking habits. Smoking characteristics of the subjects 10 were previously a smoker, 2 were currently a smoker and 1 never smoked.

Mean FEV1/FVC. FEV1 and forced vital capacity (FVC) were measured using the Pony Graphic Spirometer. The mean FEV1/FVC for COPD subjects was 60.28% (13.7), indicating mild airway obstruction.

Severity of disease. Severity of disease was staged on the basis of American Thoracic Society recommendations. The 13 patients were categorized with mild, moderate and severe airway obstruction as follow: severe airway obstruction was defined as a ratio of the forced expiratory volume in one second to the forced vital capacity (FEV1/FVC) of less than 45%. The moderate airway obstruction was defined as FEV1/FVC of 45 to 55 %; and mild airway obstruction the FEV1/FVC 55% to 70 %. By using this categorization, 10 patients had mild airway obstruction, 1 subject had moderate airway obstruction, and 2 were classified as having severe airway obstruction.

The duration of illness. The number of years the subjects had been diagnosed of COPD ranged from 1 year to 10 years. Two subjects had the duration of illness less than 1 year, 6 subjects had the duration of COPD between 1 year to 5 years, and 5 subjects were diagnosed with COPD up to 5 years.

Types of caregivers. Eight COPD subjects identified wife as the primary caregivers, 4 identified a daughter and 1 subject cared for himself.

2. The Quality of life scale before the pulmonary rehabilitation program

Table 3.2 presents the calculated mean score and standard deviations for 13 subjects on the Chronic Respiratory Disease Questionnaires (CRQ) instrument that was filled out before subjects attended the intervention program.

Table 3.2: Mean Scores and Standard Deviations on the CRQ Scale Before the pulmonary rehabilitation program.

CRQ Subscales	Preprogram Results Mean (Standard Deviation)
Dyspnea	18.23 (4.85)
Fatigue	20.69 (3.30)
Emotional function	38.69 (6.77)
Mastery	19.84 (5.17)
Total score	24.67(9.39)

3. Exercise capacity level before the pulmonary rehabilitation program

Table 3.3 presents the calculated mean scores and standard deviations for 13 subjects on the 12- minute distance walk test that was filled out before subjects attended the intervention program.

Table 3.3: Mean Scores and Standard Deviations on the 12- Minute Distance Walk Test Before the Pulmonary Rehabilitation Program.

Walking diatance (meter)	Preprogram mean (standard deviation)
	609.23 (186.17)

4. The perception of dyspnea level before the pulmonary rehabilitation program

Table 3.4 presents the calculated mean scores and standard deviations for 13 subjects on the Horizontal Visual Analogue Scale (HVAS) scores. The 13 subjects filled out the test, before attending the intervention program.

Table 3.4: Mean Scores and Standard Deviations on the Horizontal Visual Analogue Scale (HVAS) Scores Before the Pulmonary Rehabilitation Program.

Perception of Dyspnea after exercise	Preprogram mean (standard deviation)
	3.17 (1.93)

Phase 2 : Hospital -Based rehabilitation training program

Purpose

To evaluate the process and approach of the rehabilitation training program.

Evaluation questions

1. *How were the resources used for training program, were they efficient?*
2. *Were 6 classes in 6- week training program appropriate to deliver the program components?*
3. *Was the program beneficial? In what way?*
4. *Were the program's problems and obstacles identified?*
5. *Were the appropriated rehabilitation member trained, and were they working in accordance with the proposed plan?*

Evaluation Design

Both of process and outcome evaluation was used. Key issues that were addressed in order to answer the above evaluation questions focus on the following:

1. Outcome measurement was consistent with the training schedule and activities conducted according to the proposed timeline.

2. The process of evaluation at this stage consisted of evaluating
   (1) the in-class health education
   (2) the benefits of program components
   (3) the benefit of exercise training.
   (4) the understanding of rehabilitation
   (5) staff behaviors

Data collection method

Two data collection method which combined with training program phase were:

1. Observation of program activities and the patients' learning process.
2. Semi-structure interviews with COPD patients covered with the general topics about the benefit of the program, feeling about the pulmonary rehabilitation program, viewed about the relationship with professional, the benefit of exercise. The interviews were semi-structure and conducted by the program manager to obtain qualitative data.

Results

1. The teaching activities included 3- hour classes once a week every Friday for 6 weeks conducted by a rehabilitation team according to the proposed timeline and relevant to the objectives.

2. The assessment of resource utilization in this project was sufficient in covering manpower, budget, materials and time used according to the project plan.

3. Program components were well organized, appropriate and continuously consistent and program training duration in 6 classes was sufficient in covering all the program components and the exercise training. The details of 6 sessions are as follows:

   During the first group session given by the program manager, the exploring facts and figures of COPD and the overview of pulmonary

rehabilitation were emphasized. The present concept of rehabilitation programs was an on-going process. Patients were given a basic introduction to COPD.

The second session was held by a coordinating nurse that concentrated on the knowledge about causes of COPD, patho-physiological and treatment of COPD. Prevention of attacks and factors causing exacerbation were emphasized, as well as, the dangers of smoking. Retraining in breathing techniques such as pursed-lip breathing and the chest mobility exercise were instructed and practiced in class.

A specially trained nurse conducted the third session. She reviewed the key concepts from the second day and then concentrated on self-care. A variety of self- care strategies for managing disability was instructed and practiced. Most topics selected for the class were based on the participants' identified needs and the rehabilitation team provided individual assistance accordingly.

The pharmacist conducted the fourth session that included pharmacology of the COPD drugs, how they effect the obstruction, and the rationale for their use. The techniques of the inhalation used was instructed and practiced within the group. The group practiced a pursed-lip breathing and walking together at the end of this class.

The rehabilitation trained nurse conducted the fifth group session. Participants received instructions and practiced a variety of exercises and stress reduction techniques.

The program manager conducted the sixth group session. The goals of COPD rehabilitation and the review of the components in previous classes were stated again. Participants were encouraged to identify activities that enhanced a positive life-style and continued with simple exercise at home.

4. The learning process involved participation from all of the rehabilitation team and the participants and the results are describe in detail as follows:

4.1 The effectiveness of an education component

The evaluation of the 6 classes showed that after each of the classes, the patients reported high level of knowledge and skills, associated with this experience of learning process. The outcomes of educational part were:

- The patients recognized and verbalized that COPD is a long life condition that cannot be cured, but can be controlled.
- The patients understood and defined the basic components of the respiratory system.
- The patients understood and defined the changes that occurred in the respiratory system as a result of COPD.
- The patients demonstrated the correct method of diaphragmatic breathing.
- The patients demonstrated the correct method of pursed lip breathing.
- The patients recognized and described the symptoms of dyspnea and related these symptoms to his/her own dyspnea episodes.

- The patients knew and described the method that used to keep sputum thin.
- The patients demonstrated the six steps of effective coughing.
- The patients knew and described the names, actions and side effects of prescribed medication.
- The patients knew and were able to describe the environmental factors that played a role in COPD.
- The patients defined and described the ways to control his or her environment.
- The patients identified and described the signs and symptoms of the respiratory infections.
- The patients understood and demonstrated relaxation technique.
- The patients knew and demonstrated the method of energy conservation technique.
- The patients demonstrated exercise training that he/she needed to practice at home

4.2 The benefits of program components

From the interviews, the COPD patients responded to the question, " What are the most positive benefits of your involvement in the rehabilitation program? " The most frequently mention answer was the education. The COPD patients identified the formal lectures and the accompanying informal interactions with rehabilitation personnel as especially helpful in making personnel health decisions.

A typical comment from a 78-year-old man exemplified program benefits; " I had a lot of knowledge that was not good knowledge, particularly about self-management and better understanding of the disease. " Another said that; " I'm very pleased with this program I gained a lot of knowledge about COPD" and " I was glad to know that the team developed rehabilitation program for COPD patients and I enjoyed in participating in the program. "

Another program benefit that the patients identified was the opportunity to " share with people who had the same problems."

4.3 Understanding rehabilitation

Thirteen COPD patients thought that rehabilitation had a role in their health maintenance to achieve the optimal level of life. They thought they should have an active role in rehabilitation. They emphasized the importance of learning to perform rehabilitation exercises in the correct manner.

4.4 Staff behaviors

The third evaluation within the hospital- based rehabilitation phase was " Staff behaviors": behavior of the rehabilitation personnel that were supportive for the patients to become more skillfully at collaborative self-management. The patients used the term pulmonary rehabilitation team personnel to include individuals, such as, the van drivers who were

responsible to transport them to and from the program, nurses, and pharmacy.

The examples of specific staff behaviors that are supportive included " Nurses check on me all the time," " Careful monitoring by the pulmonary rehabilitation personnel made me feel safe and became more secure and comfortable with what I could do exercise without dyspnea."

4.5 Effective of exercise training

Patients described the positive aspects of exercise during exercise training by stating that " it makes me feel stronger, it helps to relax muscles, relieves fatigue and improves breathing." Another women said, "it relieved depression and loneliness as a result of taking a walk and participating in group exercise."

A typical comment from a 48- year-old identified benefits of the exercise training. " enjoy exercising with others who have similar problems and the informal interactions with staff". The exercise training for the COPD patients was implemented as planned. Most of the patients were be able to completely participate in exercise. The negative aspects of exercise included the consumption of too much time; subjects made comment such as "too painful if does not do them consistently".

None of the participants had encountered any difficulties attending to the program. All of them indicated that the program changed the way they looked at their health. The respondents all indicated that they were confident in the rehabilitation team directing their care.

Phase 3. Home- based rehabilitation and home-visit

Purpose

1. To analyze and evaluate the process of the home-based rehabilitation.
2. To evaluate the ability of the COPD patients in applying the knowledge to their own situation.

Evaluation question

1. *How was the process of home visit?*
2. *What types of exercise did the COPD patients commonly practice at his or her home? What were the barriers, if any?*
3. *Did the activities of home visits conduct according to its plan?*
4. *What did the patients feel about home visits?*
5. *What activities did the home care nurses provide to the patients?*

Evaluation design

1. Measured outcomes
   - Consistency of the home visit activities with the study objectives.
   - Patients' view of the benefit of home visit.
   - Numbers of home visit per each patient.
   - Types of exercise that the patients practiced at home.
   - Number of activities that home-care nurses provided to the patients.

2. Data collection Instrument consisted of

- Home visit record form containing date and time of visit, patient's name, address, sign and symptoms of the patients, nursing diagnosis and nursing actions, medication used, home environment, the patient's functional activities of daily living, and health status.
- In-depth interview covering about types of the exercise, problems encountered with exercise practice, the patients' view on the benefits of home visit. (Appendix 6)
- Observation of general atmosphere and environment conditions within the home and physical status of patients during the visit.

3. Time of data collection
   - During and after home visit

4. Data analysis
   - Qualitative and quantitative descriptive analysis

Results:

1. In this phase, the nurses together with the patients developed a realistic plan of daily physical activities that were based on current physical status of the patients, such as, weakness, fatigue, and dyspepsia. The other nursing actions included assessment of patients for signs and symptoms of COPD, praising when the participants demonstrate increased participation in self-care activities, and encouraging patients to discuss his/her problems and to be as active as possible in self-care activities and regularly exercise.

2. The patients reported satisfaction with home visit. Comments by the patients included " Nurse explained something that I forgot in the class, and help me feel better. This motivated me to do more", " She helped me find an alternative exercise practice, " " She kept saying, regularly exercise will help me feel better," and lastly, " She cautioned me, told me what to eat, what not to eat and encouraged me to exercise regularly. " Some patients described how information from staff during home visits led them away from concentrating on their problems and to focus instead on taking an active role in rehabilitation. They explained how information helps them to understand rehabilitation goals and to recognize when they were making progress.

3. The outcome evaluation of the home visit to 13 patients by 2 projects nurses found that:
   - The average number of home visits per patient was 3 times in six months which did not follow the original project plan. The low frequency of home visits by nurses was the result of many coincidental factors, including time constraints and perceived limitations of technological support.
   - The ability in applying program's components to the patients' owns situation: The home health care nurse reported that the COPD patients were able to manage their treatment process more effectively. They were more likely to know the use of their medications and ways to control the environment to decrease the likelihood of exacerbation of the disease

process. They were able to identify the way to prevent or minimize respiratory problems.

- The home-visit data on exercise practice showed that 12 COPD patients reported they continued regular exercises at home. The types of exercises varied individually, some of them combine exercise with their daily tasks, such as, the patients who were cowherds exercised by walking the cow, and some walk for 20 minutes 3 times a week around his or her home. One patient reported that overprotection from family members made her feel incapable and described how her daughter convinced her that rest was the most appropriate treatment.
- All subjects reported positive outcomes from using the breathing techniques. Comments from one 66 year-old man supported the positive effects of breathing exercise by stating, " I used the breathing techniques to help me bring up the mucus," " It helps to get rid of bad air in lungs." " The exercise prevents strain on chest and chest tightening." Another reported, " It helps with activities such as climbing up the stair."
- Many patients were able to articulate the positive effects on energy conservation techniques: they were able to spread their energy over the day, they gained satisfaction from being able to complete a job, their breathing was easier, and they were less tired.

Phase 4: Hospital follow-up care

Purpose

To assess for indications that the patients were able to effectively manage the therapeutic regimen.

Evaluation question

1. *Were there compliance of COPD patients in follow-up care?*
2. *What were the activities that enhance compliance?*
3. *What were the symptoms of COPD that the patients report in hospital follow-up care?*

Evaluation design

The result of the evaluation of hospital follow-up care may be divided into two sections, namely, (1) The number of symptoms describe in the patients' report, (2) The compliance rate of follow-up care in the hospital.

Evaluation methodology

At each monthly hospital follow-up visit, the out-patient rehabilitation nurse saw the patients and encouraged them to contact her at any time if the symptoms arose. The patients were asked questions about subjective symptoms of COPD that affected him/her and were asked about what he/she did to make one feel better?. Collected data on every visit was analyzed.

Data collection Method

Semi-structure interviews and individual patients' record files in the hospital

Result

All 13 patients completed 6 months of the hospital follow-up care. The total number of the hospital follow-up care was 90 visits with an average of 1.15 visits per patient per month. Two of the COPD patients experienced acute exacerbation during follow-up care in the hospital. Both of them were admitted into the hospital and after an exacerbation, they returned to their previous treatment.

Data from each of the out patient files had shown that patient noncompliance with taking medication to be as low as 10%, related to forgetfulness or not on time due to working time constraints. Five patients went to hospital follow-up care on every time schedule. The remaining did not go for hospital follow-up care in time but they reported that they took medications regularly. The patients demonstrated the effective management of the therapeutic regimen as evidenced by their participation in treatments and care. They were able to show an understanding of the implications of not following the prescribed treatment plan, understand what the medications ordered are for, including the rationale, their side effects, the method of administering, the importance of taking the prescription, maintaining the activity level, and continuos exercise practice.

The patients were able to state signs and symptoms and report to the health care team properly. They reported about the symptoms improving after rehabilitation, such

as, they felt a lesser amount of breathlessness or had less cough, felt less fatigue and weakness, increased ability to perform activities of daily living without increasing shortness of breath or chest pain. Some patients reported that unwanted symptoms such as excessive cough, difficulty falling asleep, related to anxiety and change in sputum characteristics.

Phase 5: Post intervention

Purpose

1. To evaluate the overall effectiveness of the program on the three patients' outcome namely; the quality of life, the exercise capacity and the perception of dyspnea after exercise.
2. To examine the interactive effects of two independent variables; the different age groups of participants and the different stages of the disease on the subjects' response to the pulmonary rehabilitation program on the three patients' outcome.

Evaluation question

Did the study group improve their quality of life, the exercise capacity and the perception of dyspnea after intervention?

Did the mean score of the quality of life, the exercise capacity and the perception of dyspnea of the study group differ from preprogram, 3 and 6 months after intervention?

Did the effects of the pulmonary rehabilitation program on the quality of life, the exercise capacity and the perception of dyspnea after exercise differ in the different

age groups of participants between the 40 -50 age group, the 51-60 age group and the over-61 age group?

Did the effects of the pulmonary rehabilitation program on the quality of life, the exercise capacity and the perception of dyspnea after exercise differ in the three different stages of the disease between the mild airway obstruction, moderate airway obstruction and severe airway obstruction?

Evaluation Design

1. Based on a review of the literature on the evaluation of the effectiveness of the rehabilitation program, the rehabilitation team selected measurable outcomes that are the most meaningful outcome for this study: namely,
   (1) assessment of the quality of life.
   (2) assessment of the exercise capacity.
   (3) assessment of the perception of dyspnea after exercise.
2. Compare scores on three outcomes between pre-program, 3 and 6 months after rehabilitation program of the study group.

Evaluate Methodology

Design: one group pre and post test designed. Thirteen people with COPD were evaluated before attending program, in three months and six months after completion of the rehabilitation program.

Data collection instrument

After participating in the rehabilitation program, all subjects completed the three evaluation instruments (pretest phase). Three and six month after the completion of the intervention phase, all subjects again completed the three instruments (post-test). The data collection method in evaluating three main outcome of the program was assessed by the three instruments as follow:

(1) Assessment of the quality of life: Quality of life was assessed by using specific questionnaires for patients with COPD, called the Chronic Respiratory Disease Questionnaire (CRQ). (Appendix 2) The chronic respiratory questionnaire (CRQ) is a disease specific questionnaires and is frequently applied to assess quality of life in COPD patient developed by Guyatt and coworker in 1987. The CRQ had been reported to be sensitive, valid, and responsive to treatment, including pulmonary rehabilitation and pharmacologic therapy.

The questionnaires were translated into Northern –Thai language. The chronic respiratory disease questionnaire (CRQ) consists of a 20- item interview guide that measures four aspects of quality of life over a 2-week period. It is divided into four categories: (1) dyspnea or breathing difficulty with the five most important and frequent activities (question 4a to 4e); (2) emotional function (questions 5, 8,11,13,15,17, and 19) ; (3) fatigue (questions 7, 10, 14 and 16); (4) mastery (the patient's feeling of control over the pulmonary disease and its effects) (questions 6,9,12, and 18). Patients were asked to rate their function on a seven point scale; for example 7 = " not tired at all ", 1 = " Extremely tired." The chronic respiratory disease

questionnaire (CRQ) measures the degree of dyspnea with five personal activities and, therefore, is limited in both of its applicability across patients and of its sensitivity to change in dyspnea for those activities that are not one of the five chosen by the patient. High scores indicate high quality of life.

(2) Assessment of exercise capacity: Exercise capacity was measured by the 12-minute distance walk test (12MD) developed by McGavin et al., 1976. (Appendix 3) This test, which determines how many meters the subject can walk in 12 minutes, has been used extensively in previous research involving patients with COPD. The distance covered in 12 minutes by patients walking in a level corridor at their own rate. For this test, patients were instructed to walk as far as possible during a 12-minutes period around the perimeter of a measured area as a test of the ability of a patient with COPD to function in daily activities. The 12-minute distance walk test (12MD) has demonstrated test-retest reliability (McGavin et al., 1976) as has its concurrent validity, using a progressive exercise test. The 12-minutes distance walk test (12MD) is an acceptable, simple, and sensitive index of improving of changes in everyday exercise tolerance. Patients can perform them and they probably reflect ability to perform everyday activities more closely than the more complex exercise tests.

(3) Assessment of perception of dyspnea after exercise: perception of dyspnea after exercise was measured with the Horizontal Visual Analogue Scale (HVAS) at the end of a 12-minute distance walk test, indicating their intensity of dyspnea after exercise. (Appendix 4) The scale is a 100-mm horizontal line with the anchors at each end indicating the extreme highest and lowest points. The left anchor is

marked "no shortness of breath" and the right anchor is marked "shortness of breath as bad as can be". Subjects were asked to indicate the amount of shortness of breath they were having by placing the mark at the height of the column that described their level of shortness of breath. Scoring was be done by measuring the distance in centimeters from the left end of the scale to the subject's marked. The reliability and validity of this scale as a measure of dyspnea has been reported (Gift, 1989; Gift et al; 1986).

Data analysis

Results were expressed as mean scores and standard deviations on the Chronic Respiratory Disease Questionnaires (CRQ), the 12-minute distance walk test (12MD) and the Horizontal Visual Analogue Scale (HVAS) that were filled out before subjects attended the program and again 3 months and 6 months after the program. The SPSS version 8.0 for window data analysis was used to analyze the data as follows:

1. Paired t-test was used to examine whether there was a significant difference between preprogram, 3 and 6 months after the program.
2. Dependent t-tests were used to determine if there were differed improvements after the pulmonary rehabilitation program within the different age groups of participants and the different stages of the disease for differences between the baseline, 3 and 6 months measures. Significance was set at the 0.05 level for all analyses.

Results

1. Analysis on the quality of life

Calculated mean scores and standard deviations for 13 subjects in the pulmonary rehabilitation program on the Chronic Respiratory Disease Questionnaire (CRQ) instrument that was filled out before subjects attended the program and again 3 months and 6 months after the program. Table 3.5 presents these results.

A higher mean of total scores on the CRQ 3 months and 6 months showed improvement over preprogram scores indicated that patients had some degree of quality of life.

Table 3.5: Mean scores and standard deviations on the CRQ Scale before and after the pulmonary rehabilitation program.

CRQ Subscales	Preprogram results X (SD)	Results 3 months after the program X (SD)	Results 6 months After the program X (SD)
Dyspnea	18.23 (4.85)	24.07 (5.02)	25.76 (4.85)
Fatigue	20.69 (3.30)	22.69 (3.40)	24.46 (3.01)
Emotional function	38.69 (6.77)	37.92 (5.17)	42.23 (4.71)
Mastery	19.84 (5.17)	19.38 (5.20)	23.61 (4.25)
Total score	24.67(9.39)	25.63 (8.41)	28.86 (8.96)

Among the subscales of the CRQ, the dyspnea and fatigue subscales had shown improvement at 3 months after the program. At 6 months after the program, total scores on the CRQ showed improvement over total preprogram scores as well as on each of the four subscales.

Using t-test for paired samples to determine whether there was a significant difference between preprogram and 3 months after the program on the Chronic Respiratory Disease Questionnaires (CRQ). Table 3.6 shows these results. Among the subscales of the CRQ, the dyspnea and fatigue subscales showed significant improvement at three months after the program. Total scores on the CRQ at 3 month after the program showed no significant difference over total preprogram scores as well as the emotional function and mastery subscales.

Table 3.6: Results of paired t-test analysis of mean scores on the CRQ taken before and 3 months after the pulmonary rehabilitation program.

CRQ Subscales	Mean Difference	SD	T Value	P*
Dyspnea	5.84	4.75	4.43	**.001***
Fatigue	2.00	3.13	2.30	**.040***
Emotional function	0.76	5.41	0.51	.618
Mastery	0.46	5.47	0.30	.766
Total Score	**0.96**	**2.80**	**0.68**	**.542**

* The level of significance was established at $p < 0.05$

Table 3.7 shows the results when compared 3- month post-program on the CRQ scores with 6-month post-program on the CRQ scores using a paired t-test analysis. There were significant difference between the total CRQ scores and the scores on the dyspnea, the emotional function and the mastery subscales taken 3 months after the pulmonary rehabilitation program and again at 6 months after the conclusion of the program. There were no significant difference between the 3 - and 6-month post

program scores on the fatigue subscales. These results indicated that except for the fatigue subscales, subjects' quality of life remained relatively stable for dyspnea and fatigue subscales for the period from 3 to 6 months after the pulmonary rehabilitation program.

Table 3.7: Results of paired t-test analysis of mean scores on the CRQ taken 3 months and 6 months after the pulmonary rehabilitation program (N=13).

CRQ Subscales	Mean Difference	SD	T Value	P*
Dyspnea	1.69	1.43	4.24	.001*
Fatigue	1.76	3.85	1.65	.124
Emotional function	4.30	5.57	2.78	.016*
Mastery	4.23	4.95	3.08	.010*
Total Score	**3.22**	**1.27**	**5.08**	**.015***

* The level of significance was established at $p < 0.05$

Using a paired t-test analysis to determine if scores on the CRQ 6 months after the program was significantly different from preprogram scores. The result indicated that there was still a significant difference on the total mean score and three of the subscales (the emotional function subscale was an exception) between preprogram and 6-month post program scores, as shown in Table 3.8.

Table 3.8: Results of paired t-test analysis of mean scores on the CRQ taken preprogram and 6 months after the pulmonary rehabilitation program (N=13).

CRQ Subscales	Mean Difference	SD	T Value	P*
Dyspnea	7.53	4.33	6.27	.000*
Fatigue	3.76	3.63	3.74	.003*
Emotional function	3.53	7.92	1.61	.133
Mastery	3.76	5.03	2.69	019*
Total Score	**4.19**	**1.83**	**4.56**	**.020***

*The level of significance was established at $p < 0.05$

2. Analysis on the exercise capacity

Calculated mean scores and standard deviations for 13 subjects in the pulmonary rehabilitation program on the 12-minute distance walk test (12MD) that was filled out before subjects attended the program and again 3 month and 6 months after the program. Table 3.9 presents these results. A higher mean scores on the 12- minute distance walk test (12MD) at 3 months and 6 months showed improvement over preprogram scores indicated that patients had increased in exercise capacity.

Table 3.9: Mean scores and standard deviations on the 12- Minute Distance Walk Test (12MD) before and after the pulmonary rehabilitation program.

	Preprogram X (SD)	3 months after program X (SD)	6 months after program X (SD)
Walking distance (meters)	609.23 (186.17)	694 .38 (197.60)	737.92 (214.64)

Using a paired t-test analysis to determine whether there was a significant difference in mean scores between preprogram and 3 months after the program on the 12- Minute Distance Walk Test (12MD). Table 3.10 shows this result. There was significant difference between preprogram and 3 month after the program scores on the 12 -minute distance walk (12MD) ($t = 3.00$; $p = .011$)

Table 3.10: Paired t-test analysis on preprogram and 3 months after program mean scores on the 12- Minute Distance Walk Test (12MD).

Time	Mean Scores	SD	t Value	p*
Preprogram Scores	609.23	186.17	3.00	. 011*
3 - Months Scores	694.38	197.60		

* The level of significance was established at $p < 0.05$

Table 3.11 shows the results when compared 3 month post-program with 6 month post program on the 12-minute distance walk test (12MD) using a paired t-test analysis. There was significantly different between 3 months and 6 months after the program on the 12-minute distance walk test (12MD) as following:

Table 3.11: Paired t-test analysis between 3 months and 6 months after the pulmonary rehabilitation program on the 12-minute distance walk test (12MD).

Time	Mean Scores	SD	t Value	p *
3 months after program scores	**694.38**	**197.60**	**2.24**	**.045***
6 months after program scores	**737.92**	**214.64**		

*The level of significance was established at $p < 0.05$

Using a paired t-test analysis to determine if scores on the 12-minute distance walk test (12MD) at 6 months after the program was significantly different from preprogram scores. The result indicated that there was a significant difference between preprogram and 6-month post program scores on the 12-minute distance walk test (12MD); as shown in Table 3.12.

Table 3.12: Paired t-test analysis of mean scores on the 12-minute distance walk test (12MD) between preprogram and 6 months after the pulmonary rehabilitation program.

Time	Mean Scores	SD	t Value	p *
Pre-program scores	609.23	186.17	4.7	.000*
6 months after program scores	737.92	214.64		

*The level of significance was established at $p < 0.05$

3. Analysis on the perception of dyspnea after exercise

Calculated mean scores and standard deviations for 13 subjects on the Horizontal Visual Analogue Scale (HVAS) scores. The 13 subjects filled out the test, before attending the program and again 3 months and 6 months after the program. Table 3.13 presents the mean score. Lower mean scores on the Horizontal Visual Analogue Scale (HVAS) at 3 months and 6 months indicated that patients had decreased in dyspnea after exercise which is considered an improvement.

Table 3.13: Mean scores and standard deviations on the Horizontal Visual Analogue Scale (HVAS) scores before and after the pulmonary rehabilitation program.

	Preprogram	3-months after	6- months after
Perception of dyspnea after exercise	X (SD)	program X (SD)	program X (SD)
	3.17 (1.93)	1.61 (.96)	1.25 (.67)

A paired t-test analysis were used to determine whether there was a significant difference in mean scores between preprogram and 3 months after the program on the Horizontal Visual Analogue Scale (HVAS) scores. Table 3.14 shows this result. A paired t-test showed a significant difference in participants' perception of dyspnea after exercise after participating in the pulmonary rehabilitation program. The mean score before the program was 3.17 centimeters, with the highest possible dyspnea score being 10 centimeters. The mean score 3 months after the program was 1.61. These results showed the improvement in participants' perception of dyspnea after exercise and showed a significant difference. ($t = 3.83$; $p = .002$)

Table 3.14: Paired t-test analysis of preprogram and 3 months after the pulmonary rehabilitation mean scores on the Horizontal Visual Analogue Scale (HVAS).

Time	Mean Scores	SD	t Value	p *
Preprogram	**3.17**	**1.93**	**3.83**	**.002***
3 months after program	**1.61**	**.96**		

*The level of significance was established at $p < 0.05$.

Table 3.15 presents the results when compared 3- month and 6-month post-program on the Horizontal Visual Analogue Scale (HVAS) scores. A paired t-test showed a significant difference in participants' perception of dyspnea after exercise after participating in the pulmonary rehabilitation program. The mean score on 3 months after the program was 1.61 and the mean score 6 months after the program was

1.25. These results showed significant difference between 3 months and 6 months after the program in the participant's perception of dyspnea after exercise. (t = 2.84; p = .015).

Table 3.15: Paired t-test analysis of 3 months and 6 months after the pulmonary rehabilitation mean scores on the Horizontal Visual Analogue Scale (HVAS).

Time	Mean Scores	SD	t Value	p*
3 months after program	**1.61**	**.96**	**2.84**	**.015***
6 months after program	**1.25**	**.67**		

*The level of significance was established at $p < 0.05$.

In addition, a paired t-test analysis between preprogram and 6 month post program scores on the Horizontal Visual Analogue Scale (HVAS) showed a significant difference existed. The results of the perception of dyspnea after exercise are shown in Table 3.16.

Table 3.16: Paired t-test analysis of preprogram and 6 months after the pulmonary rehabilitation mean scores on the Horizontal Visual Analogue Scale (HVAS).

Time	Mean Scores	SD	t Value	p*
Preprogram	**3.17**	**1.93**	**5.00**	**.000***
6 months after program	**1.25**	**.67**		

*The level of significance was established at $p < 0.05$.

4. Analysis on the different age groups of participants on the patients' outcomes.

The age groups of the subjects were divided into three age groups, namely the 40-50 age group, the 51-60 age group and the over-61 age group. There were 13 participants in this study, of which 2, 5 and 6 were staged as having the 40-50 age group, the 51-60 age group and the over-61 age group. The study also examined the interactive effects of the different age groups of the participants on the three outcomes as follow:

4.1 Analysis on the quality of life between the three different age groups of participants.

The quality of life among the three different age groups of the subjects were measured and presented in Table 3.17. All three age groups showed improvements in all four of the CRQ subscales at 3 and 6 months after the rehabilitation program over the four scales at baseline scores indicated that all three groups had higher quality of life after participated in the pulmonary rehabilitation program.

Table 3.17: Mean scores and SD on the Chronic Respiratory Disease Questionnaires (CRQ) before and after the pulmonary rehabilitation program in the three different age groups of the participants.

CRQ Subscale	Time	40-50 age group	51-60 age group	Over-61 age group
Dyspnea	Baseline	18.00(2.83)	16.20(5.66)	20.00(4.34)
	3 months	26.00(5.66)	23.60(6.11)	23.50(5.05)
	6 months	25.00(4.24)	25.40(6.39)	23.67(6.35)
Fatigue	Baseline	21.50(2.12)	19.20(2.59)	21.33(4.46)
	3 months	22.50(.71)	21.80(4.02)	24.00(2.83)
	6 months	24.00(.00)	25.40(3.44)	23.83(3.31)
Emotional function	Baseline	40.00(8.49)	37.20(8.14)	39.50(6.25)
	3 months	41.50(9.19)	36.60(5.86)	37.83(3.60)
	6 months	43.50(2.12)	41.60(5.86)	42.33(4.89)
Mastery	Baseline	22.00(8.49)	19.20(5.76)	19.67(4.59)
	3 months	24.50(.71)	15.20(2.68)	21.17(5.23)
	6 months	24.00(.00)	22.60(6.99)	24.33(1.63)

To determine if there were improvements after the rehabilitation program within the three different age groups, dependent t-tests were used to test the differences between the baseline and 3 months after the intervention. Table 3.18 presents the result.

Only dyspnea subscale improved significantly in two groups; the over-61 age group and the 51 – 60 age group from baseline to 3 months after program. There were no significant changes from baseline to 3 months after program among the three age groups for three of the subscales of CRQ including fatigue, emotional function and the mastery subscales.

Table 3.18: Comparison of the mean scores and standard deviation on the Chronic Respiratory Disease Questionnaires (CRQ) at baseline and 3 months after intervention in the three age groups of the participants.

CRQ subscale	Time	40-50 age groups	51-60 age groups	Over-61 age group
Dyspnea	Baseline	18.00(2.83)	16.20(5.66)	20.00(4.34)
	3 months	26.00(5.66)	23.60(6.11)	23.50(5.05)
	Difference	8.00	7.40	3.50
	p Value	.410	.049*	.003*
Fatigue	Baseline	21.50(2.12)	19.20(2.59)	21.33(4.46)
	3 month	22.50(.71)	21.80(4.02)	24.00(2.83)
	Difference	1.00	2.60	2.69
	p Value	.500	.159	.082
Emotional	Baseline	40.00(8.49)	37.20(8.14)	39.50(6.25)
function	3 month	41.50(9.19)	36.60(5.86)	37.83(3.60)
	Difference	1.50	.60	1.67
	p Value	.205	.846	.514
Mastery	Baseline	22.00(8.49)	19.20(5.76)	19.67(4.59)
	3 month	24.50(.71)	15.20(2.68)	21.17(5.23)
	Difference	2.50	4.00	1.50
	p Value	.728	.119	.475

*The level of significance was established at $p < 0.05$.

To determine if there were improvements after the rehabilitation program within the three age groups between baseline and 6 months after the program, Table 3.19 presents the results. Participants among the three age groups experienced improvement on the all four subscales of the CRQ, only those with the 51-60 and the over-61 age groups showed significant improvement in their dyspnea subscale from baseline to 6 months after the intervention. Fatigue subscale improved significantly only in the 51 – 60 age group. Emotional function showed no significant difference in all three age groups. Only those with over-61 age group had significant difference in the mastery subscale.

Table 3.19: Comparison of the mean scores and standard deviation on the Chronic Respiratory Disease Questionnaires (CRQ) at baseline and 6 months after intervention in the three age groups of the participants.

CRQ subscale	Time	40-50 age groups	51-60 age groups	Over-61 age groups
Dyspnea	Baseline	18.00(2.83)	16.20(5.66)	20.00(4.34)
	6 month	25.00(4.24)	25.40(6.39)	23.67(6.35)
	Difference	7.00	9.20	3.67
	p Value	.395	.025*	.050*
Fatigue	Baseline	21.50(2.12)	19.20(2.59)	21.33(4.46)
	6 month	24.00(.00)	25.40(3.44)	23.83(3.31)
	Difference	2.50	6.20	2.50
	p Value	.344	.030*	.151
Emotional	Baseline	40.00(8.49)	37.20(8.14)	39.50(6.25)
function	6 months	43.50(2.12)	41.60(5.86)	42.33(4.89)
	Difference	3.50	4.40	2.83
	p Value	.720	.422	259
Mastery	Baseline	22.00(8.49)	19.20(5.76)	19.67(4.59)
	6 month	24.00(.00)	22.60(6.99)	24.33(1.63)
	Difference	2.00	3.40	4.67
	p Value	.795	.243	.049*

*The level of significance was established at $p < 0.05$.

4.2 Analysis on the exercise capacity between the three age groups of the subjects

Comparison of results from the three age groups of the subjects on the 12-minute distance walk test (12MD) at baseline, 3 months and 6 months after the intervention are shown in Table 3. 20. All three groups showed improvement in the 12-minute distance walk (12MD) test from baseline to 3 and 6 months after the rehabilitation program indicated that all three groups had increased in their exercise capacity after participation in the rehabilitation program.

At 3 and 6 months after program, the over-61 age group showed an average increase of 123.66 meter (23.81%) and 134.5 meter (25.90%), respectively, on the 12-minute distance walk (12MD) test over baseline distance walk. And the subjects who were in the 51-60 years of age showed an average increased of 71.8 meter (10.59%) and 124 meter (18.30%) at 3 and 6 months after the intervention over baseline distance walk. The subjects who were in the 40-50 years of age demonstrated slight increase of 3 meter on the 12-minute distance walk test (12MD) at 3 months after the rehabilitation program and at 6 months this groups had increased of 123 meter (17%) over baseline distance walk.

Table 3. 20: Mean scores and SD on the 12-minute distance walk test before and after the pulmonary rehabilitation program in the three age groups of the participants.

Time	40-50 age groups	51-60 age groups	Over 61 age groups
Baseline	709.00(40.01)	677.40(30.18)	519.17(252.51)
3months	712.00(.00)	749.20(25.94)	642.83(294.71)
6months	832.00(111.72)	801.40(41.96)	653.67(300.97)

Using a paired t-test analysis to determine whether there was a significant difference between the three age groups of the participants on the 12-minute distance walk test (12MD) before and 3 months after the program. Table 3.21 shows these results. All three groups increased 12-minutes distance walk from baseline to 3 months after the rehabilitation program, only the increased in 51-60 age group were significantly improved. The smallest gains were made in the 40-50 age group.

Table 3.21: Comparison of the mean scores on the 12-minute distance walk test (12MD) at baseline and 3 months after program between the three age groups of the participants.

Time	40-50 age groups	51-60 age groups	Over 61 age groups
Baseline	709.00(40.01)	677.40(30.18)	519.17(252.51)
3 months	712.00(.00)	749.20(25.94)	642.83(294.71)
Difference	3	71.80	123.67
p Value	.934	.033*	.074

*The level of significance was established at $p < 0.05$.

To determine whether there was a significant difference between the three age groups of the participants on the 12-minute distance walk test (12MD) before and 6 months after the program, Table 3.22 shows these results. The 12-minute distance walk test increased in all three groups from baseline to 6 months after program. The 51-60 and over-61 age groups increased significantly the 12-minute distance walk, whereas the 40-50 age group did not.

Table 3.22: Comparison the mean scores on the 12-minute distance walk test (12MD) at baseline and 6 months after program between the three age groups of the participants.

Time	40-50 age groups	51-60 age groups	over 61 age groups
Baseline	709.00(40.01)	677.40(30.18)	519.17(252.51)
6 months	832.00(111.72)	801.40(41.96)	653.67(300.97)
Difference	123.00	124.00	134.50
p Value	.459	.009*	.045*

*The level of significance was established at $p < 0.05$.

4.3 Analysis on the perception of dyspnea after exercise between the three age groups of the participants

The effects of the rehabilitation program on the perception of dyspnea after exercise in the three age groups of the participants measured by the Horizontal Visual Analogue Scale (HVAS) are shown in Table 3. 23. The perception of dyspnea after exercise decreased in all three age groups from baseline to 3, 6 months after program

indicated that all three groups decreased in their perception of dyspnea after exercise after participation in the rehabilitation program.

Table 3.23 Mean scores and SD on the Horizontal Visual Analogue Scale (HVAS) before and after the pulmonary rehabilitation program in the three age groups of participants.

Time	40-50 age groups	51-60 age groups	Over 61 age groups
Baseline	2.80(2.12)	2.66(2.28)	3.73(1.78)
3 months	1.50(071)	1.80(1.30)	1.50(.84)
6 months	1.00(.00)	1.60(1.34)	1.50(.84)

Using a paired t-test analysis to determine whether there was any significant difference between the three age groups of the participants on the Horizontal Visual Analogue Scale (HVAS) before and 3 months after the program. Table 3.24 shows these results.

The perception of dyspnea after exercise measured by the HVAS decreased in all three age groups; however, only the decreases in the over-61 age group was significantly different from baseline to 3 months after the rehabilitation program.

Table 3.24: Comparison of the mean scores on the Horizontal Visual Analogue Scale(HVAS) between before and 3 months after the pulmonary rehabilitation program in the three age groups of participants.

Time	40-50 age groups	51-60 age groups	Over 61 age groups
Baseline	2.80(2.12)	2.66(2.28)	3.73(1.78)
3 months	1.50(071)	1.80(1.30)	1.50(.84)
Difference	1.300	.860	2.23
p Value	.633	.123	.008*

*The level of significance was established at $p < 0.05$.

To determine whether there was a significant difference between the three age groups of the participants on the Horizontal Visual Analogue Scale (HVAS) before and 6 months after the program. Table 3.25 shows these results.

The perception of dyspnea after exercise measured by the HVAS decreased in all three groups from baseline to 6 months after program, only the decreased in the over-61 age group was significantly different. There was no significant difference in the perception of dyspnea after exercise between baseline and 6 months after program either in the 40-50 age group and the 51-60 age group.

Table 3.25: Comparison of the mean scores on the Horizontal Visual Analogue Scale (HVAS) between before and 6 months after the pulmonary rehabilitation program in the three age groups of participants.

Time	40-50 age groups	51-60 age groups	Over- 61 age groups
Baseline	2.80(2.12)	2.66(2.28)	3.73(1.78)
6 months	1.00(.00)	1.60(1.34)	1.50(.84)
Difference	1.80	1.060	2.23
p Value	.442	.101	.003*

*The level of significance was established at $p < 0.05$.

5. Analysis of the different stages of the disease on the patients' outcomes.

Severity of disease was staged on the basis of American Thoracic Society recommendations. The 13 patients were categorized with mild, moderate and severe airway obstruction as follows:

Severe airway obstruction was defined as a ratio of the forced expiratory volume in one second to the forced vital capacity (FEV1/FVC) of less than 45%. Moderate airway obstruction was defined as a ratio of the forced expiratory volume in one second to the forced vital capacity (FEV1/FVC) of less than 45% to 55 %. Mild airway obstruction was defined as a ratio of the forced expiratory volume in one second to the forced vital capacity (FEV1/FVC) of less than 55% to 70 %.

By use this categorization, 10 patients had mild airway obstruction, 1 subject had moderate airway obstruction, and 2 were classified as having severe airway obstruction. An independent analysis was performed to examine the influence of the three different stages of the disease on the subjects' response to the intervention for each of the three dependent variables was as follow:

5.1 Analysis on the quality of life among the three different stages of the disease

Measures of the quality of life among the three different stages of the disease are presented in Table 3.26. All three groups showed increase in the four subscales of the Chronic Respiratory Disease Questionnaires (CRQ) at 3 and 6 month after the rehabilitation program over baseline scores indicated that the three groups of participants had some degree of quality of life after participation in the rehabilitation program.

Table 3.26: Mean scores and standard deviations on the Chronic Respiratory Disease Questionnaires (CRQ) before and after the pulmonary rehabilitation program in the three different stages of the disease.

CRQ subscale	Time	Mild	Moderate	Severe
Dyspnea	Baseline	18.20(5.09)	24.00(.00)	15.50(.71)
	3 months	25.00(4.94)	26.00(.00)	17.50(.71)
	6 months	25.50(5.93)	26.00(.00)	19.00(1.41)
Fatigue	Baseline	20.50(3.95)	22.00(.00)	20.00(1.41)
	3 months	23.00(2.94)	23.00(.00)	22.50(6.36)
	6 months	25.20(2.30)	27.00(.00)	19.50(.71)
Emotional	Baseline	37.80(7.36)	39.00(.00)	43.00(4.24)
function	3 months	38.10(5.86)	36.00(.00)	38.00(2.83)
	6 months	42.80(4.71)	46.00(.00)	37.50(2.12)
Mastery	Baseline	19.70(5.89)	22.00(.00)	19.50(2.12)
	3 months	19.10(5.49)	21.00(.00)	20.00(7.07)
	6 months	24.10(4.63)	23.00(.00)	21.50(3.54)

To determine if there were improvements after the rehabilitation program within the three different stages of the disease, dependent t-tests were used to test for the differences between the baseline and 3 months after the intervention. Table 3.27 presents the result. All three groups showed increase in the four subscales of the Chronic Respiratory Disease Questionnaires (CRQ) at baseline and 3 months after the rehabilitation program; however, only the mild airway obstruction group showed significant improvement in their dyspnea and fatigue subscale. There were no

significant changes from baseline to 3 months after the intervention among any of the groups for emotional function and mastery subscales of the CRQ.

Table 3.27: Comparison of the mean scores and SD on the Chronic Respiratory Disease Questionnaires (CRQ) at baseline and 3 months after intervention in the three different stages of the disease.

CRQ subscale	Time	Mild	Moderate	Severe
Dyspnea	Baseline	18.20 (5.09)	24.00	15.50 (.71)
	3-months	25.00 (4.94)	26.00 (.00)	17.50 (.71)
	Difference	6.80	2.00	3.50
	p Value	.002*	none	.090
Fatigue	Baseline	20.50 (3.95)	22.00	20.00 (1.41)
	3-months	23.00 (2.94)	23.00	22.50 (6.36)
	Difference	2.50	1	2.50
	p Value	.020*	none	.090
Emotional	Baseline	37.80 (7.36)	39.00	43.00 (4.24)
function	3-months	38.10 (5.86)	36.00	38.00 (2.83)
	Difference	.30	3.00	5.00
	p Value	.861	none	.500
Mastery	Baseline	19.70 (5.89)	22.00	19.50 (2.12)
	3-months	19.10 (5.49)	21.00	20.00 (7.07)
	Difference	.60	1	.50
	p Value	.762	none	.910

*The level of significance was established at $p < 0.05$.

To determine if there were improvements after the rehabilitation program within the three different stages of the disease between baseline and 6 months after the program, Table 3.28 presents the results. The dyspnea, fatigue and mastery subscale of the CRQ improved significantly only in the group with mild disease from baseline to 6 months after the rehabilitation program. There was no significant improvement in the emotional function subscales in the mild disease. Both the moderate and severe disease groups showed no significant difference from baseline to 6 months among any of the four subscales of the CRQ.

Table 3. 28: Comparison of the mean scores and standard deviation on the Chronic Respiratory Disease Questionnaires (CRQ) at baseline and 6 months after intervention in the three different stages of the disease.

CRQ subscale	Time	Mild	Moderate	Severe
Dyspnea	Baseline	18.20(5.09)	24.00(.00)	15.50(071)
	6-months	25.50(5.93)	26.00(.00)	19.00(1.41)
	Difference	7.30	2.00	3.50
	p Value	.003*	none	.090
Fatigue	Baseline	20.50 (3.95)	22.00	20.00 (1.41)
	6-months	25.20 (2.30)	27.00	19.50 (.71)
	Difference	4.70	5.00	.50
	p Value	.004*	none	.795
Emotional	Baseline	37.80 (7.36)	39.00	43.00 (4.24)
function	6-months	42.80 (4.71)	46.00	37.50 (2.12)

	Difference	5.00	7.00	5.50
	p Value	.066	none	.437
Mastery	Baseline	19.70 (5.89)	22.00	19.50 (2.12)
	6-months	24.10 (4.63)	23.00	21.50 (3.54)
	Difference	4.40	1.00	2
	p Value	.035*	none	.295

*The level of significance was established at $p < 0.05$.

5.2 Analysis on the exercise capacity in the three different stages of the disease.

Measures of the exercise capacity are presented in Table 3.29. All three different stages of the disease showed increase in the 12- minute distance walk (12MD) from baseline to 3 and 6 months after intervention.

Table 3.29: Means scores and SD of the participants on the 12-minute distance walk test (12MD) at baseline, 3 and 6 months after the pulmonary rehabilitation program in the three different stages of the disease.

Time	Mild	Moderate	Severe
Baseline	591.50(210.84)	630(.00)	687.50(3.54)
3 months	670.60(220.22)	774(.00)	773.50(86.97)
6 months	713.70(238.93)	908(.00)	774(41.01)

Using a paired t-test analysis to determine whether there was any significant difference between the three different stages of the disease on the 12-minute distance

walk test (12MD) before and 3 months after the program, Table 3.30 shows these results. The 12-minute distance walk increased in all three different stages of the disease from baseline to 3 months after program; there was no significant difference among any of the groups on the 12-minute distance walk test.

Table 3.30: Comparison the mean scores on the 12-minute distance walk test (12 MD) at baseline and 3 months after program between the three severity groups of disease.

Time	Mild	Moderate	Severe
Baseline	591.50(210.84)	630	687.50(3.54)
3 months	670.60(220.22)	774	773.50(86.97)
Difference	79.10	144	86.00
p Value	.053	none	.407

*The level of significance was established at $p < 0.05$.

To determine whether there was any significant difference between the three different stages of the disease on the 12-minute distance walk test (12MD) before and 6 months after the program, Table 3.31 shows these results. The 12-minutes distance walk increased in all three groups from baseline to 6 months after program; however, only the increased in the mild group was significant. There was no significant difference in increases in the 12-minutes distance walk among the three different stages of the disease.

Table 3.31: Comparison the mean scores on the 12-minutes distance walk test (12 MD) at baseline and 6 months after program between the three different stages of the disease.

Time	Mild	Moderate	Severe
Baseline	591.50(210.84)	630.00	687.50(3.54)
6 months	713.70(238.93)	908.00	774(41.01)
Difference	122.70	278.00	86.00
p Value	.033*	none	.407

*The level of significance was established at $p < 0.05$.

5.3 Analysis on the perception of dyspnea after exercise between the three different stages of the disease.

The effect of the rehabilitation program on the perception of dyspnea after exercise in the three different stages of the disease of the participants were measured by the Horizontal Visual Analogue Scale (HVAS) as shown in Table 3. 32. All three groups portrayed lower mean scores on the Horizontal Visual Analogue Scale (HVAS) at 3 months and 6 months after the intervention from baseline indicated that all three groups decreased in their perception of dyspnea after exercise after participation in the rehabilitation program.

Table 3.32: Mean scores and standard deviation on the Horizontal Visual Analogue Scale (HVAS) before and after the pulmonary rehabilitation program in the three different stages of the disease.

Time	Mild	Moderate	Severe
Baseline	2.56(1.43)	2.70(.00)	6.50(.00)
3 month	1.40(.70)	1.00(.00)	3.00(.00)
6 month	1.10(.32)	1.00(.00)	3.50(.71)

Using a paired t-test analysis to determine whether there was any significant difference between the three severity groups of disease of the participants on the Horizontal Visual Analogue Scale (HVAS) before and 3 months after the program, Table 3.33 shows these results. The perception of dyspnea after exercise as measured by HVAS decreased in all three different stages of the disease; however, only the decrease in the mild disease was significantly different from baseline to 3 months after the rehabilitation program. No significant differences were found when comparing changes in the Horizontal Visual Analogue Scale (HVAS) from baseline to 3 months after the rehabilitation program among the three different stages of the disease.

Table 3.33: Comparison of the mean scores on the Horizontal Visual Analogue Scale (HVAS) between before and 3 months after the pulmonary rehabilitation program in the three different stages of the disease.

Time	Mild	Moderate	Severe
Baseline	2.56(1.43)	2.70(.00)	6.50(.00)
3 months after program	1.40(.70)	1.00(.00)	3.00(.00)
Difference	1.160	1.70	3.50
p Value	.017*	none	.177

*The level of significance was established at $p < 0.05$.

To determine whether there was any significant difference between the three different stages of the disease of the participants on the Horizontal Visual Analogue Scale (HVAS) before and 6 months after the program, Table 3.34 shows these results. The perception of dyspnea after exercise as measured by HVAS decreased in all three different stages of the disease from baseline to 6 months after program, only the decrease in the mild disease was significantly different. There was no significant difference in the perception of dyspnea after exercise between baseline and 6 months after program either in the moderate or the severe disease groups. No significant differences were found when comparing changes in the HVAS from baseline to 6 months after the rehabilitation program among the three severity groups of disease.

Table 3.34: Comparison of the mean scores on the Horizontal Visual Analogue Scale (HVAS) between before and 6 months after the pulmonary rehabilitation program in the three different stages of the disease.

Time	Mild	Moderate	Severe
Baseline	2.56(1.43)	2.70(.00)	6.50(.00)
6 months after program	1.10(.32)	1.00(.00)	3.50(.71)
Difference	1.460	1.70	3.00
p Value	.005*	none	.105

*The level of significance was established at $p < 0.05$.