PULMONARY REHABILITATION

MODEL OF CARE

National COPD Clinical Care Programme

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1 Introduction

Pulmonary Rehabilitation is defined “as evidence based multidisciplinary and comprehensive intervention for patients with chronic respiratory diseases who are symptomatic and often have decreased daily life activities. Integrated into the individualised treatment of the patient, pulmonary rehabilitation is designed to reduce symptoms, optimize functional status, increase participation and reduce health care costs through stabilizing or reversing systemic manifestations of the disease. It includes strategies for life-long management.” (1)

A model of care requires a holistic patient centered approach to the provision of services to patients. It involves best practice through the application of a set of service principles across the health service. It identifies essential elements to ensure high quality service. These elements are the health system, the community, delivery system design, decision support, clinical outcome measures and self-management support. Evidence based concepts are required with each element in combination with productive interactions between informed patients and providers.

1.1 Overview

Improving the health of people through pulmonary rehabilitation creates a system that is proactive and focused on keeping a person as healthy as possible. The culture of pulmonary rehabilitation accepts that a major impairment is present which cannot be improved by conventional medical treatment. This impairment is that of de-conditioning due to inactivity, mainly caused by breathlessness. The breathlessness leads to increased fear of exertion and avoidance of activity.

To maintain improvements, integration of services across the health sector to produce a range of community and hospital based services delivered by a multidisciplinary team (MDT) is required.

The role of the MDT members must be clearly defined to ensure a continuum of care.

The role of the patients/consumers in participating and managing their own health is clearly defined in the principles of self management and support services.

The GP / Consultant / Respiratory Team as the primary health provider have a number of key roles including the early identification and diagnosis and referral to specialist services such as pulmonary rehabilitation.

The model can be applied to different health care settings.
1.2 The evidence base for Pulmonary Rehabilitation

Research shows that the benefits of pulmonary rehabilitation for patients with COPD are widely accepted. High levels of scientific evidence have demonstrated improved exercise capacity and health related quality of life and decreased breathlessness, fatigue and health care utilization following pulmonary rehabilitation. There is increasing evidence showing reduced health care utilisation, particularly bed days with evidence level 1 A (Cochrane review). There is also evidence for reduction in dyspnoea and improving quality of life and level 11B (Cochrane review) for reducing health care. Programs need to be embedded in evidence based guidelines relayed into daily clinical practice. All treatment decisions need to be based on proven guidelines supported by clinical research. Ongoing training is required for staff to remain up-to-date on latest evidence._(1-6) pulmonary rehabilitation must meet the current standards for delivery.

1.2.1 Guiding principles

- Program provision by a Multidisciplinary Team, paying attention to the individual needs of patients and carers
- Inclusion of physical training, disease education, self-management, nutritional management, psychological, social and behavioral intervention.
- Reduction in symptoms and disability aiming to improve function and quality of life.
- Development of consistent protocols and pathways between health care providers
- Education and training of workforce to meet the needs of patients in the pulmonary rehabilitation program
- Continuous audit of effectiveness of the program.
- Patient centered and easily accessible
2 Referral Criteria for Pulmonary Rehabilitation

Pulmonary rehabilitation should be available to all patients with chronic respiratory disease who consider them-selves to be functionally disabled with dyspnoea. In practice this would manifest itself for patients as a breathless score on activity equal to 3 on the MRC Dyspnoea Scale.

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
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<td>▪ confirmed diagnosis of respiratory disease</td>
<td>▪ uncontrolled cardiovascular conditions limiting participation in an exercise programme</td>
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<tr>
<td>▪ functionally limited by dyspnoea despite optimal therapy</td>
<td>▪ Significant orthopaedic or neurological conditions that reduce mobility or cooperation with physical training.</td>
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<tr>
<td>▪ able to travel to venue</td>
<td>▪ ability to exercise independently without supervision</td>
</tr>
<tr>
<td>▪ motivated to participate and change lifestyle</td>
<td>▪ uncontrolled cardiovascular conditions limiting participation in an exercise programme</td>
</tr>
<tr>
<td>▪ ability to exercise independently without supervision</td>
<td>▪ Significant orthopaedic or neurological conditions that reduce mobility or cooperation with physical training.</td>
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The decision to provide or with-hold pulmonary rehabilitation must be based on a thorough individual assessment and should be at the discretion of the service provider.

In the case of COPD, referral is recommended within two weeks of an acute exacerbation as it aims to reduce the risk of readmission. (7-8) An Irish study reported that the patients who may benefit from pulmonary rehabilitation often miss out due to repeat exacerbations. This study reported that early rehabilitation via a home from hospital programme improved exercise tolerance, muscle strength, dyspnoea scores, quality of life and the number of subsequent exacerbations. (9)

Programme Referrer

Patients should be referred to a PRP by a Respiratory or General Physician. The referrer should be available to the staff providing the programme to discuss any medical problems that may arise during rehabilitation.

Referral Process

A clear defined referral process is required by the Respiratory or General Physician that ensures the individual has a medical assessment of their suitability for the Pulmonary Rehabilitation and that their pharmacological management has been optimized. The referrer...
should be informed of the results of pre and post assessments or any issues with patient such as the patient declining the PRP or deemed unsuitable after assessment.(10)

**Recommendations**

1. Pulmonary Rehabilitation should be accessible for patients with chronic respiratory disease limited by dyspnoea and follow evidence-based referral criteria.

2. Assessment should be available to all patients restricted in their daily lives as a result of chronic lung disease, with primary focus on patients who complain of breathlessness on activity an MRC score ≥ 3.

3. A standard referral (see Appendix 1) should be available to all pulmonary rehabilitation programmes.

4. Pulmonary rehabilitation should be initiated as early as possible after an exacerbation with home rehabilitation if appropriate.
3 Pulmonary Rehabilitation Model

“In practice, the details of program construction and setting will vary with different cultures and health care systems. There is no internationally recognised formula for the design of a program because its structure may reflect the commissioning policy or health care needs of its country” (1)

Studies on the efficacy of pulmonary rehabilitation in an Irish population have been published and demonstrated significant efficacy. (6)

3.1 Components of Pulmonary Rehabilitation

3.1.1 Assessment

This involves the multidisciplinary team to provide a comprehensive assessment.

1. Review of past medical history with special regard for respiratory history and co morbid conditions such as orthopedic, neurology and cardiovascular conditions that may affect participation in programme.

2. Review of inhaled medications to ensure they are optimal for the disease stage

3. Documentation of pulmonary function tests

4. Subjective assessment to include MRC score(if not previously stated on referral)

5. Physiological baseline measures: Heart rate, blood pressure, respiratory rate, Borg score, oxygen saturations, Body Mass Index, Fat free mass.

6. Agreed goals (when appropriate)

7. Practical assessment tools are used to guide quality improvement efforts and evaluate changes in care.

8. Standardised validated and reliable tools for all measured areas must be used.

9. For exercise testing, at least one measure is required from either the Six-minute walk test (x2), the Incremental shuttle walk test(x2) and the endurance shuttle test are used to measure exercise capacity. Choice of test selection may be influenced by space, time, cost and equipment. The ISWT is best for prescribing intensity. It is recommended that tests are completed twice due to huge variations during testing.(11-16)

One generic and one disease specific questionnaire should be used from the following list The St. Georges Respiratory Questionnaire, the Chronic Respiratory Disease Questionnaire (four formats) and the Hospital Anxiety and Depression scale and the EuroQol (EQ-5D). The Chronic Respiratory Disease Questionnaire is more sensitive to change with Pulmonary Rehabilitation. The EuroQol defines health status in terms of 5
dimensions and also records a patients ‘perception of overall health on a Visual Analogue Scale. The use of the CAT questionnaire is increasing. This questionnaire is easier to use, less time consuming than the SGRQ yet measures the same outcomes. It would require much less education for use in the community setting. The COPD assessment Test is responsive to pulmonary rehabilitation but has not been validated in an Irish population to date. Permission and costs can apply to use some of these measures and details can be found in the appendix. (16-19)

For minimum clinically important difference figures for the assessment tools see Appendix 2.

A measure of symptoms and moods such as The Hospital anxiety and depressions scale is essential. (10) (17-20)

Recommendations

1. A standardized assessment sheet (see Appendix 1) with a list of current tools of assessment should be available.

2. An assessment database should be maintained by each facility for audit and to ensure consistency in the delivery between pulmonary rehabilitation programs.

3.1.2 Exercise

“Exercise training is widely regarded as the cornerstone of pulmonary rehabilitation.” (1)

Physical aerobic training is mandatory. (3-4 Upper limb and lower limb strength and endurance training are recommended.

Supervised exercise sessions allows healthcare staff to provide motivation, reassurance and encouragement.

3.1.2.1 Intensity of training

This is predetermined from the assessment for each individual and it is increased through the programme as tolerated. It must identify the individual patients' limitation to exercise. It can be prescribed from a symptom limited maximal incremental test or from an incremental walking test. (12) A VO2 max of 60-80% is recommended. (3) If no Vo2 max figure is available, intensity can be monitored using the Borg score with target level of dyspnoea. In clinical practice,
Symptom scores are used to adjust training load: Borg score of 4-6 for dyspnoea or fatigue is usually a reasonable target. High intensity is recommended as it produces greater physiological benefit and should be encouraged however; low-intensity training is also effective for those patients who cannot achieve this level of intensity. Intensity may have to be modified because of disease severity, symptom limitation and co-morbidities. (21)

3.1.2.2 Strength and endurance training of upper and lower limbs

Muscle atrophy is common in chronic respiratory disease. A reduction in peripheral muscle mass compared to normal subjects has been demonstrated. (22) Low intensity peripheral muscle training has been found to improve muscle bulk and strength. This has been proven to produce improvements in walking endurance, muscle strength and health status but not maximal exercise capacity. (23-25)

3.1.2.3 Flexibility and stretches

Brief period (5-10 minutes) recommended to maintain muscle length and prevent injury and soreness (10)

3.1.2.4 Interval Training

Interval training may be useful in promoting higher levels of exercise training in the more symptomatic patients. This is recommended as it allows smaller bouts of high intensity work rated to be achieved with lower symptoms. (26-28)

3.1.2.5 Frequency

Two exercise sessions of 1 hour duration should be supervised at the pulmonary rehabilitation class. An additional three home exercise sessions of 30 minutes should be formulated for the patient (1, 3, 4 26, 29).

3.1.2.6 Safety during exercise

Patients should be screened by both referrer and the health professional performing assessment for the presence of co-morbidities that may compromise their safety during exercise such as symptomatic Ischaemic Heart disease.

During Exercise testing and training sessions measures of heart rate, oxygen saturations and dyspnoea at rest scores should be recorded. Before exercise testing or training sessions if there
is an abnormal resting heart rate < 50 or > 125bpm or saturation <90% or BORG score >4 delay exercise testing or training until this has improved. (10)

Stop any form of exercise immediately if any individual develops chest pain, evidence of a new cardiac arrhythmia, dizziness or nausea. Monitoring of heart rate and saturations is necessary throughout exercise training. During supervised training sessions saturations and heardt rate should be regularly measured.(10)

Consider stopping or resting if:

- Increased heart rate such that it approaches age predicted maximum
- SaO2 < 85%
- Marked wheeze

Advised patients to bring short-acting bronchodilators, Glyceryl trinitrate spray to every session and if diabetic to bring glucose supplement to encourage independent management of any hypoglycemic events.

3.1.2.7 Impacts of co-morbidities on exercise training

**Osteoporosis and Osteoarthritis**

Exercise may exacerbate pain in this cohorts of patients. Document during assessment and take care when prescribing exercise. Modify exercises on initial prescription to address these problems and progress exercises only after at least 2 supervised sessions if there is no increase in pain.

**Body composition abnormalities**

Underweight patients may require nutrition advice prior to commencing PRP (caloric supplements may be required) to ensure extra physical activity does not lead to further weight loss.

Overweight patients may need exercises modified as it may be difficult to exercise due to concurrent musculoskeletal problems. They may also need nutritional advice regarding weight loss.

**Intermittent Claudication**

Patients with this condition may be limited by symptoms during their walking. To gain optimal improvement they should be advised to walk beyond the onset of their pain for as long as tolerated. (10)
3.1.3 Education

Patient education remains a core component of comprehensive pulmonary rehabilitation, despite the difficulties in measuring its direct contribution to overall outcomes.

The style of teaching used in pulmonary rehabilitation is changing from traditional didactic lectures to self-management education. Although the former provides information related to the patient’s condition and his or her therapy, the latter teaches self-management skills that emphasize illness control through health behavior modification, thus increasing self efficacy, with the goal of improving clinical outcomes including adherence. (1)

Education runs in conjunction with exercise. It should cover relevant topics associated with chronic lung disease. It should be delivered by any health care professional or other person who has relevant expertise that may be useful on a particular topic- (e.g.) dietician, psychologist, previous patients, and allied health professionals.

Chronic respiratory disease is associated with an increased risk of anxiety, depression and other mental health disorders. There is evidence of an association between the severity of disability and the levels of anxiety and depression. Psychological and social support must be provided in the pulmonary rehabilitation setting. This can facilitate the adjustment process by encouraging adaptive thoughts and behaviors thus helping patients to diminish negative emotions and may improve compliance with rehabilitation. Pulmonary rehabilitation groups can allow supportive counseling and address patient concerns. Patients can be taught to recognize symptoms of stress and learn stress management techniques including relaxation training. (1, 30, 31) Multidisciplinary team members with the appropriate expertise to address these issues are essential to the success of pulmonary rehabilitation.

1. Education sessions should be supported by written information
2. Key topics recommended by guidelines are;
   o Anatomy, physiology, pathology, nutritional advice, disease education, breathing techniques and psychological and behavioral intervention. Pharmacology, symptom management, chest clearance techniques, energy conservation, anxiety management, goal setting, relaxation exacerbation management, end of life issues.
3. The Respiratory Passport may be a valuable addition for education.

Recommendations

1. Education and training to meet the psychological and social needs of patients should be considered for health professionals delivering rehabilitation programs.
2. Screening for anxiety and depression should be part of the patients’ initial assessment.
3. Patients with significant psychiatric disease should be referred for appropriate care
4. Patients should be taught to recognise symptoms of stress and be capable of stress-management techniques.

5. Relaxation training should be integrated into the patients’ daily routine, for tackling dyspnoea and controlling panic.

### 3.1.4 Self-management support

At all times there should be an emphasis on the patient’s central role in managing their condition. All patients with chronic illness make decisions and engage in behaviours that affect their health. Healthcare workers should acknowledge the patients central role in their care and the sense of responsibility for their own health. Self-management cannot begin and end with a class. There is a need for a collaborative approach, providers and patients working together to define problems, set priorities, establish goals, create treatment plans, and solve problems along the way.

**Recommendation**

1. On completion of program all patients should be provided with information regarding existing voluntary groups/networks to which they can contact for ongoing support and social interaction. Patients also need information on local venues where they can continue to exercise, links with community centers, PCCC and local gyms may be beneficial.

### 3.2 Adjuncts to pulmonary rehabilitation

#### 3.2.1 Inspiratory Muscle Training (IMT)

IMT can be an adjunct to the exercise training component of pulmonary rehabilitation in patients with poor baseline inspiratory muscle strength. Adding IMT to standard exercise training in these patients has been shown in some studies to improve exercise capacity more than exercise training alone. In patients with less respiratory muscle weakness, evidence for the addition of IMT to regular exercise is lacking. (1, 25)

**Recommendation**

- Although the data is inconclusive, IMT could be considered as adjunctive therapy in pulmonary rehabilitation, primarily in patients with proven inspiratory muscle weakness.
3.2.2 Non-invasive Ventilation (NIV)

NIV may be used as an adjunct to exercise training in selected patients with severe chronic respiratory disease and suboptimal response to exercise. It may allow for greater training intensity through unloading respiratory muscles. It must be acknowledged that the use of NIV as an adjunct to exercise training is a difficult and labour-intensive intervention and should be used only in those with demonstrated benefit from this therapy. (3, 32-34.)

3.2.3 Oxygen Therapy

Patients who are receiving long-term oxygen therapy should have this continued during exercise training, but may need increased flow rates. Oxygen supplementation during pulmonary rehabilitation, regardless of whether or not oxygen desaturation during exercise occurs, often allows for higher training intensity and/or reduced symptoms in the research setting. However it is still unclear at the present time whether this translates into improved clinical outcomes.

Prescription of oxygen can be difficult as patients with a normal oxygen tension at rest can show frequent and sometimes severe desaturation with activities of daily living. (35)

For exercise testing supplementary oxygen therapy should be available if a patient desaturates on testing ≤90%. The test should be repeated on 2-4 litres oxygen as necessary to maintain oxygen saturations ≥ 88% .(36) If oxygen is deemed necessary to use on exercise i.e. a significant improvement in walking distance, oxygen saturations or reduction in dyspnoea long term oxygen therapy must be considered.(3)

3.2.4 Neuromuscular electrical stimulation (MNES)

This has been proven to increase exercise tolerance and peripheral muscle strength after 6 weeks of a home programme to the quadriceps muscles. This was used on severe COPD patients with weekly supervision from the physiotherapist, it demonstrated physiological improvements and a reduction in perceived dyspnoea. (37-40)
4 Delivery of Pulmonary Rehabilitation

4.1 Staffing Resources

The design and implementation of a program requires the following:

(A) A nominated consultant with an interest in respiratory care should be responsible for the program.

(B) A coordinator who will run the program and is responsible for policies, referrals, assessments patient selection, classes, outcome measures and audit. The coordinator should come from a profession allied to medicine with exercise training background.

(C) A multidisciplinary team with appropriate training and resources which may include:

4.1.1 Role of the Physiotherapist

The Physiotherapist is most often the MDT member responsible for delivery of Pulmonary Rehabilitation to patients with COPD. Physiotherapists are involved in all processes of the rehabilitation program from recruitment of patients, assessment and identification of problems,
delivery of the rehabilitation and liaison with community services to enhance lifelong behavioral change. With their background in exercise prescription and evidence-based practice, physiotherapists are ideally placed to play a major role in the provision of pulmonary rehabilitation programmes.

Physiotherapists maintain a high profile in the delivery, assessment and management of pulmonary rehabilitation, working closely with other allied health professionals, they are often the main providers of the service.

Other MDT role profiles can be found in Appendix 3.

4.2 Location Resources

Pulmonary rehabilitation can have varied settings. Each setting has its own advantages and disadvantages. (1, 3, 43)

A review of outcomes shows comparable results between the hospital and community based programmes. It is necessary to form partnerships between community and hospital settings to support and develop pulmonary rehabilitation and to maintain benefits achieved. (5, 24, 29, 44)

4.2.1 Facility and Equipment

The PRP venue should have space of either a level corridor or walking track suitable to carry out a field walking test. (10)

Table below includes equipment for PRP

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<thead>
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<th>Minimum required</th>
<th>Optimal</th>
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<tr>
<td><strong>Pulse Oximetry</strong></td>
<td>Weights machine</td>
</tr>
<tr>
<td><strong>Blood Pressure Monitor</strong></td>
<td>Static bike</td>
</tr>
<tr>
<td><strong>Stopwatch</strong></td>
<td>Spirometry</td>
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<tr>
<td><strong>Walking track/corridor</strong></td>
<td>Glucometer</td>
</tr>
<tr>
<td><strong>Stairs/step</strong></td>
<td>Inspiratory muscle trainers</td>
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### 4.2.2 Emergency Equipment

A first aid kit with a CPR mask, gloves and rescue medications (inhales short-acting bronchodilator and spacer, glucose replacement and Glycerine Trinitrate spray) is recommended. (3)

Emergency response in the community setting may comprise of telephone access to ambulance service and in the hospital setting for staff to be familiar with the hospital emergency response protocol.

#### Recommendations

1. A database of all pulmonary rehabilitation programs needs to be available nationwide. It needs to provide contact information of the co-ordinator, number of sessions, outcomes used etc

2. Assessment clinics and program delivery for pulmonary programs with medical supervision should be predominantly based in the community particularly for those with mild to moderate disease. Oxygen therapy would need to be provided at the location in case it is required by the patient.

3. Patients with more complex needs should be referred to a hospital-based assessment clinic and program. In all cases programs should be arranged to maximize patient choice with regard to day, time and venue.

### 4.3 Group Size

Class size will depend upon the venue available. Class size should be limited to less than 15 to allow safe and individual attention to be provided.

Staff to patient ratios recommended are 1:8 (UK) 1:4 (US) for exercise training and 1:16 (UK), 1:8 (US) for the education session. It is recommended that two staff members are always present during the exercise class for safety reasons. One senior member of staff must be present at all times. (1, 3, 45)

Patient safety and disease severity are the most important factors to consider when determining this ratio.
4.4 Duration

The minimum duration of exercise training in pulmonary rehabilitation has not been extensively investigated but it is generally believed that longer programmes yield larger, more reliable training effects. Guidelines recommend that a minimum of 20 sessions are required overall. These sessions should be given at a minimum of three times and up to five times per week to achieve physiological benefits. Twice weekly supervised sessions plus one unsupervised home session may also be acceptable. Regular supervision of exercise sessions is necessary to achieve optimal physiologic benefits. Each exercise session should last at least 30 minutes. (1, 3, 4, 26, 29) Providers of services should take account of accessibility and transport needs of patients and carers.

In practice most pulmonary rehab programmes are of 8 weeks duration of three classes weekly.

4.5 Maintenance Programmes

At present there is no substantial evidence that prolonged maintenance treatment is beneficial, or if it is what form it should take. (3) Studies showed a decline in exercise tolerance and health status after 6-12 months. (5, 13, 46) However further studies have shown that although exercise tolerance declines over 12 months post rehabilitation it is still greater than baseline before rehabilitation. (47-49) If it does have a role then comparisons have suggested that monthly follow-up results in greater improvements than weekly follow-up perhaps because of greater self-reliance. (50) Factors influencing the effectiveness of maintenance programmes include motivation, disease deterioration, lifestyle changes and possible frequency of exacerbation.

4.6 Support Groups

Support groups provide an environment for patients and carers to share information, friendship, experiences and encouragement. It allows the patient to take an active role in their health management. Groups are run by patients and may be facilitated by health care professionals. Following a PRP patients should be advised of their local group or to consider establishing a group if there is none in their locality. (10)

4.7 Measurable Outcomes resulting from Pulmonary Rehabilitation

The collection of data will help to track and plan care, identify additional care, facilitate performance monitoring and quality improvement efforts.
4.7.1 Patient Outcomes

Patient Outcomes may include:

- Improved exercise capacity- Incremental Shuttle Walk Test, Six Minute Walk Test
- Improved breathlessness score- Borg scale of breathlessness; also very valuable is the Dyspnoea component of the CRDQ which has been validated for use on its own as a measure of dyspnoea. As the patient has identified, at the initial assessment, the 5 activities that produce the worst dyspnoea, improved dyspnoea scores following the programme directly affect Quality of life of the individual. Visual Analogue Scale.
- Quality of life questionnaires-St.George’s Respiratory Questionnaire, Chronic Respiratory Disease Questionnaire.
- Reduced anxiety and depressions –Hospital Anxiety and Depression Scale,
- Improved knowledge of disease and capacity to self manage –Respiratory Passport.
- Reduced exacerbations and hospital admissions benefitting both patient and cost to health service.
- Patient feedback

For the minimal clinically important difference values (MCID) available for outcomes see Appendix 2.

Recommendation

1. On completion of a pulmonary rehabilitation program a summary of results must be provided to the patient and to the referral source.

4.7.2 Measurable Outcomes

The national COPD programme has identified a number of statistics which will require reporting on an annual basis. The database which has been developed for Pulmonary Rehabilitation will hold the majority of the data required for reporting to the national programme. The statistics will enable the national COPD programme baseline the performance of existing Pulmonary Rehabilitation programmes around the country in terms of staffing capacity, attendance numbers and patient outcomes (exacerbations, quality of life etc). The national COPD programme would hope that all Pulmonary Rehabilitation programmes return statistics nationally to enable the national COPD programme generate a baseline, workforce plan, forecast benefits and set targets for expansion of Pulmonary Rehabilitation services nationally.
4.7.3 Benefits plan

A benefits plan will be developed in 2012 based on the information collected from 2011 baseline statistics. All sites will be requested to sign-up to the measures and associated targets for delivery of Pulmonary Rehab to the national model.

4.8 Data Collection

Each pulmonary rehabilitation programme will be required to report centrally to the COPD Programme for a year on key performance indicators and benefits plan.

All pulmonary rehabilitation programs must collect data to facilitate audit and research. There is currently an active Irish Thoracic Society Pulmonary rehabilitation research group.

The minimum data set for collected for each program location should include:

- Waiting list /Demand and capacity for the site
- Referral source
- Referral numbers
- Compliance of participants- number completing class, non-completed, non-starters.
- Number of supervised sessions per week
- Number of weeks of program
- Types of exercises used
- Exercise tests used
- Quality of life questionnaires used
- Education provided
- Onward referral to support group and exercise facilities post rehabilitation
- Number GP visits pre/post/during PRP related to exacerbation
- Number ED visits related to an exacerbation during PRP
- Number of admissions pre/post/during PRP
Recommendations

1. Each pulmonary rehabilitation programme should be able to demonstrate standardised measureable outcomes and data resulting from the program.

2. Each pulmonary rehabilitation programmes’ structure and process along with the outcome measures should be audited internally annually if possible.

3. Follow up evaluation of hospital admissions and bed days for year pre and post rehabilitation should be performed to assist in a cost analysis.

4.9 Localisation of Pulmonary Rehab

Although resources may be limited, programs can be configured to provide maximum benefit for the population, whatever strategy adopted. (1)

It is acknowledged that models of care are time limited and will need to be dynamic given the changing health environment.

Recommendation

1. The Pulmonary Rehabilitation model should be adapted to meet local needs taking account of the essential components for successful care.
5 MDT Roles in Pulmonary Rehabilitation

5.1 Physiotherapist

5.1.1 Selection of patient

Physiotherapists can advise re selection of patients for pulmonary rehabilitation with reference to the patient’s ability to exercise and compliance with same as demonstrated during previous hospital admissions. Recent research demonstrates the effectiveness of pulmonary rehabilitation immediately post an infective exacerbation and as physiotherapists are involved in the in-patient care of this episode they are in a good position to aid in the selection process for out-patient pulmonary rehabilitation. However, a clear referral process is required irrespective of which health care professional (HCP) makes the referral.

5.1.2 Exercise testing

The health care professional responsible for exercise testing should have a good knowledge of the principles of exercise testing, and the limitations to same, including hypoxaemia and musculo-skeletal problems. Physiotherapists are experts in the area of the principles of exercise testing and exercise prescription and in how musculoskeletal problems can limit the patient’s ability to perform.

5.1.3 Assessment of supplemental oxygen needs

Patients often desaturate during exercise testing and may need supplemental oxygen in the form of portable or long term oxygen therapy (LTOT). In many institutions physiotherapists are working as extended scope practitioners in this area, and can be trained to take Arterial Blood Gas samples in order to facilitate the prescription of LTOT.

5.1.4 Quality of life (QoL) assessment

The assessment of QoL may be performed by any (HCP) including physiotherapists. It is important that the HCP performing this function can establish a good rapport with the patient so that an accurate assessment in this area is made.
5.1.5 Supervision of exercise programme

The supervisor of an exercise programme should be able to make the necessary changes to the individual patient’s exercise prescription, with reference to the FITT principle (Frequency, Intensity, Time, Type). Physiotherapists are ideally placed to adapt the programme to each individual as necessary, consideration being given to modification of the programme to suit increases in the patient’s strength and endurance levels, and also modifications following acute exacerbations, when the patient may need a less demanding programme.

5.1.6 Prescription of home exercise

Home exercise is prescribed following the initial exercise testing at the commencement of the programme. Consideration should be given to the patient’s previous lifestyle, home facilities, co-morbidities and safety issues. Often, assistive aids may be necessary such as walking frames, rollators, and / or systems for carrying portable oxygen. Physiotherapists have a great deal of expertise in these areas.

5.1.7 Inspiratory muscle training (IMT)

If IMT is to be prescribed the FITT principles must be adhered to, following an appropriate pulmonary function strength test. Again this is an area of physiotherapy expertise.

5.1.8 Breathing retraining and Airway Clearance

This includes techniques such as pursed lip breathing, positions of ease, Active Cycle of Breathing Technique (ACBT) and the use of adjuncts such as PEP or Flutter devices. These are techniques, which are taught by physiotherapists on a daily basis.

**Inhaler use** – may be physiotherapist or respiratory nurse

**Relaxation therapy** – may be physiotherapist or occupational therapist

**Continence**
The degree of urinary incontinence had been shown to be greater in those with chronic cough due to COPD compared with a normal population with stress incontinence ref

The presence of urinary incontinence may impact on the individuals' ability and/or willingness to perform certain activities, such as airway clearance techniques and especially during exacerbation of COPD.

Evidence from the BTS guidelines recommended that:

Patients with COPD should be questioned about their continence status

All patients with chronic cough, irrespective of continence status, should be taught to contract the pelvic floor muscles before forced expirations and coughing

If problems of leakage are identified, patients should be referred to a physiotherapist specializing in continence.

5.1.9 Re-assessment

If possible the re-assessments should be carried out by the HCP who performed the initial assessment.

5.1.10 Co-ordinator of programme

There is no definitive rule about who should co-ordinate a pulmonary rehabilitation programme, except that the co-ordinator should have an understanding of the medical, physical, and emotional condition of each patient and be prepared to change the programme to suit the individual patient at any specific time. If the co-ordinator is expected to prescribe and supervise the exercise programme, a physiotherapist is most suited for this role.

References:


5.2 Occupational Therapist (OT)

5.2.1 Pre-assessment:

If available, the occupational therapist should be involved in the pre-assessment phase of pulmonary rehabilitation. At present the assessment of daily activities remains poorly evaluated in patients with COPD and other respiratory diseases, (CSP, 2003). However, there have been significant advances in the development of assessment tools in the last decade including:

- Pulmonary Function Status Scale (PFSS)
- London Chest Activity of Daily Living Scale (LCADL)
- Manchester Respiratory Activities of Daily Living Questionnaire

The use of the OT tool the Canadian Occupational Performance Measure (COPM) to highlight activity limitations and for early identification of equipment needs aid to streamline the patient journey. The COPM also includes a goal setting section, which can be used as part of the outcome measurement of the programme. Onward referrals to community OT etc. can be facilitated at this stage.

The OT can also facilitate administering of the HADS scale, which is widely used to screen for anxiety and depression.

5.2.2 Pulmonary Rehabilitation programme

The role of the OT during the Pulmonary Rehabilitation can include providing sessions in the following areas:

- Instruction in energy conservation techniques:

Education in task simplification/ modification, energy conservation and fatigue management are core OT skills. The prescription of adaptive equipment to aid energy conservation is also addressed by the OT. NICE Guidelines (2010) state that energy conservation education is a core element in the educational component of Pulmonary Rehabilitation programmes. Velloso et al (2006) state that "in order to intervene in an efficient manner in the function of patients with
COPD, it is necessary to implement an educational programme including the use of energy conservation techniques”.

- **Facilitating independence in personal and domestic activities of daily living and the use of graded therapy programmes to increase activity tolerance/endurance:**

Activity limitation is one of the most common symptoms of COPD. It can be the consequence of dyspnoea and poor exercise functional capacity, and is associated with impairment in quality of life and increased mortality, (Roche, 2009). Therefore, improving the level of daily activity is a major goal in the care of COPD patients and should be included in any Pulmonary Rehabilitation programme. Occupational therapists are skilled healthcare professionals who specialise in activity analysis and activity grading and are ideally placed to be a core and valuable member of the Pulmonary Rehabilitation team.

Occupational therapists bring expertise to pulmonary rehabilitation in using appropriately challenging, purposeful activity to maximize patients’ activity tolerance, functional capabilities, and perceived control over their disease, (Migliore, 2004).

While occupational therapists are currently involved in evaluating and treating functional symptoms of COPD, including dyspnoea, their role has not been fully developed, especially in multidisciplinary outpatient pulmonary rehabilitation programs.

Recent studies have shown positive results from occupational therapy programmes that were carried out in educating patients in symptom management whilst doing specific activities. A structured Pulmonary Rehabilitation programme that includes occupational therapy sessions should aim to facilitate patients’ learning and mastery of controlled-breathing strategies in real life situations. The use of biofeedback should be considered. The occupational therapy intervention should be individualised, purposeful, and goal-directed to gain best results.

An example would be dyspnoea management strategies education by an occupational therapist in the context of a kitchen environment, (Lorenzi, 2004). Domestic independence appears to be an important goal of rehabilitation in COPD patients however access to individual OT is not a standardized procedure for Pulmonary Rehabilitation programmes but would be a useful adjunct. Studies show that behavioural method which is what is employed by occupational therapists, emphasising the use of techniques during specific activities causing dyspnoea, is more effective than didactic instructions alone in facilitating participants' learning needs during a comprehensive PR programme, (Lorenzi, Clini, 2005).
• **Instruction in Stress Management techniques:**

Anxiety, depression and difficulties in coping with chronic disease are common in COPD patients and contribute to morbidity. Psychosocial and behavioural intervention in pulmonary rehabilitation may include educational sessions or support groups focusing on specific problems such as stress management, or instruction in progressive muscle relaxation, stress reduction and panic control, (ATR, ESR 2004)

Occupational therapy training includes psychosocial and physical aspects of an illness which provides the occupational therapist with the unique experience of treating clients in a holistic manner. Occupational therapists can deliver practically focused anxiety management/ stress management sessions. Decrease in anxiety symptoms can positively influence occupational engagement.

• **Instruction in relaxation techniques**

The Chartered Society of Physiotherapy evidence briefing of 2003 stated that there was Level 1a evidence for relaxation training in pulmonary rehabilitation programmes in reducing dyspnoea. Occupational therapists often deliver this element of pulmonary rehabilitation programmes and integrate the techniques into coping strategies to use in occupational performance/ performance of activities of daily living.

• **Assessment of the home environment to ensure safe discharge home**

This could include: environmental advice on the layout of the home to maximise function and provision of equipment for example bath board, shower chair, wheelchair for long distance mobility.

• **Recommendations regarding vocational abilities:**

Occupational therapists can provide vocational assessment and advice regarding workplace adaptations, work routine modification.
5.2.3 Post-programme:

The OT should be present at re-assessment phase to re-administer and compare the ADL scale results and to identify any ongoing areas of difficulty for the patient. Review of the COPM and the goals set at pre-assessment phase is a useful outcome measure.

References:


The effectiveness of pulmonary rehabilitation: evidence and implications for physiotherapists.


5.3 Dietician
A qualified Dietitian/Clinical Nutritionist applies knowledge of food, nutrition and other related disciplines such as biochemistry, physiology and social science to promote health, prevent disease and aid in the management of illness including COPD. Nutrition intervention in this patient group can minimise loss of fat-free mass, thereby improving exercise tolerance and respiratory muscle strength, reduce patient morbidity and mortality, reduce susceptibility to infection and optimise quality of life.

The role of the Dietitian in pulmonary rehabilitation includes:

- Education and training of other healthcare professionals on use of nutrition screening tools with onward referral to dietitian as indicated
- Provision of nutrition component of pulmonary rehabilitation programme/ education of other health professions on role of nutrition in pulmonary rehabilitation
- Delivery of structured education programme/ individualised nutrition intervention as required

Pulmonary rehabilitation programmes should include multi-component, multidisciplinary interventions, which are tailored to the individual patient’s needs. The rehabilitation process should incorporate a programme of physical training, disease education, nutritional, psychological and behavioural intervention. NICE guidelines 2010, grade A evidence

Nutritional screening of patients with COPD provides an easy and inexpensive way of detecting malnourished patients who need further assessment and nutrition support.

All patients with COPD should be screened using a recognised and validated screening tool such as MUST (Malnutrition Universal Screening Tool).

Screening should include the following:

- Measurement of weight and height and calculation of BMI.
- History of unintentional weight loss
- History of poor appetite/anorexia

If there is access to methods to assess body composition (e.g. Tanita), fat free mass (FFM) can be measured.

**MUST (Malnutrition Universal Screening Tool)**
MUST is a 5 step nutrition screening tool to identify adults who are malnourished, at risk of malnutrition (undernutrition) or obese. It also includes management guidelines which can be used to develop a care plan. It is based on an assessment of the patients body mass index, percentage weight change and disease status.


5.3.1 Who should be referred to the dietitian?

Patients who have COPD and are identified as being at risk of malnutrition (NICE, 2006) i.e:

- BMI of less than 20 kg/m$^2$ (NICE, 2010)
- Unintentional weight loss of greater than 5% within the last 3 months or 10% in the last 6 months. (ERS/ATS COPD Guidelines)
- Little or nothing eaten for more than 5 days/or likely to eat little or nothing for the next 5 days or longer.
- Fat free mass index (FFMI) < 16kg/m$^2$ in males, < 15kg/m$^2$ in females (if equipment is available to assess body composition).

In addition to those at risk of malnutrition, the following patient groups should also be considered:

- Patients who are obese, BMI > 30kg/m$^2$ (these patients may be seen in OPD rather than as inpatients)
- Patients who have any other diagnosis that requires dietetic advice e.g newly diagnosed diabetes or Coeliac disease etc.
- Patients who require enteral or parenteral feeding

5.3.2 Nutritional implications of COPD

Patients with COPD regularly experience periods of poor dietary intake with subsequent weight loss and nutritional depletion. Involuntary weight loss in this patient group is an independent predictor of prognosis and is associated with
increased morbidity and mortality.

- Fat free mass (FFM) is an independent predictor of survival in COPD. Patients with reduced fat free mass can have worse health related quality of life than underweight patients with preserved FFM (Mostert et.al. 2000).

- Survival studies have consistently shown significantly greater mortality rates in underweight and normal weight patients with COPD than in overweight and obese COPD patients. The increased mortality risk may be due to direct effects on lung function. It may also be due to adverse effects of the loss of FFM on skeletal strength, exercise capacity and health status that may increase the frequency or severity of acute exacerbation of the disease (Schols et. al. 2005).

- Muscle wasting defined as fat free mass index (FFMI) < 16kg/m2 in males and < 15kg/m2 in females is found in 25% of patients with GOLD stages 2 and 3 and in up to 35% of cases with severe disease GOLD stage 4. (Celli et. Al. 2004)

Factors contributing to low body weight in patients with COPD include:

- Increased resting energy expenditure
- Increased energy expenditure during activity
- Reduced dietary intake

### 5.3.3 Further nutritional implications of COPD

- Impaired immune function and hence increased susceptibility to infection and sepsis, infection will further impair a malnourished state
- Delayed wound healing
- Increased risk of pressure sores, particularly due to loss of cushioning from fat stores
- Muscle wasting and weakness which may effect:
- Respiratory function: impaired respiratory muscle strength makes it difficult for a patient to cough and expectorate effectively, thus increasing risk of chest infection
• Reduced lung function and dyspnoea
• Reduced maximal oxygen consumption (VO₂ max.)
• Decreased peripheral muscle function
• Cardiac function: this may be impaired, resulting in reduced cardiac output and risk of heart failure
• Mobility: weakness of skeletal muscles delays a return to full mobility; reduced mobility increases the risk of thromboembolism and bedsores
• Decreased exercise performance
• Altered structure of the small intestine which may result in malabsorption
• Increased risk of postoperative complications (during lung volume reduction surgery)
• Apathy and depression leading to loss of morale and reduced will to recover
• General sense of weakness and illness which impairs appetite and physical ability to eat and hence tends to perpetuate and worsen the state of undernutrition
• Decreased quality of life
• Increased need for hospitalization
• Increased mortality

During an exacerbation problems such as loss of appetite, difficulties chewing and swallowing secondary to altered mechanics of breathing are evident.

**Nutrition Support – advice for patients who are underweight or have suffered significant weight loss**

• *Nutrition support can help minimise loss of fat free mass, resulting in improved respiratory muscle strength*

Between 25% and 40% of pts with advanced COPD are malnourished (NICE, 2006). Clinically relevant weight loss (5% of actual weight in 3 months or 10% within 6 months) is found in 25-40% of all cases when lung function is severely impaired (FEV1 <50%).

**Nutritional Supplements**
Nutritional supplements should be considered in all patients with COPD who have a BMI of less than 20kg/m². These patients should be encouraged to exercise to augment the effects of nutritional supplementation. (NICE, 2010).

Nutritional supplements are frequently necessary for patients who have COPD in order to meet increased energy needs and ensure adequate energy intake to prevent weight loss.

Frequent small amounts of oral nutritional supplements (ONS) are preferred to avoid post prandial dyspnoea and satiety and to improve compliance – grade B ESPEN

In stable COPD there is no additional advantage of disease specific low CHO, high fat ONS compared to standard high protein or high energy ONS. – grade B ESPEN

Other nutritional problems associated with COPD

Patients with COPD who are referred to the dietitian should be individually assessed and given advice tailored to the individual.

Nutritional advice should also focus on common nutritional issues experienced by patients with COPD e.g.

- post prandial dyspnoea
- early satiety and feeling of fullness
- poor appetite

Obesity

The role obesity plays in COPD is of important significance. Although obesity is not a risk factor for COPD, there is clinical evidence which suggests an increasing, influential relationship between the two. Obesity can lead to worsening of COPD symptoms, and a decrease in both exercise tolerance and quality of life. Following the recommended nutritional guidelines, participating in moderate activity and maintaining a healthy weight can provide significant improvement in symptoms.

Dietary advice for weight loss may be more beneficial in outpatient clinic settings or as group sessions.

Other nutrients:
Antioxidants can help prevent lipid peroxidation triggered by free radicals and assist in the repair of tissue damaged by oxidative stress. However, no specific recommendations have been made for antioxidant supplementation in respiratory disease.

Omega 3 fatty acid supplementation may improve lung function in patients with COPD (Chi & Canada 2006). However, studies so far have been small. A diet rich in omega-3 polyunsaturated fatty acid (PUFA)-rich diet may be beneficial but further evidence is required.

Calcium & vitamin D - there is a high prevalence of osteoporosis in patients with COPD. This may be in part due to concurrent smoking and the use of corticosteroids. However, COPD itself may be associated with bone mineral loss (MacNee et al, 2004). Advice on increasing calcium and vitamin D content of diet may be required if diets are lacking. Supplementation may be necessary.

Pulmonary rehabilitation

It is essential that Dietitians are involved in pulmonary rehab. Pulmonary rehab may be run as an outpatient program within hospitals or in the community. Dietary education should include advice for people who are underweight and overweight and include tips on overcoming eating problems frequently associated with COPD.

Advice on improving dietary intake in combination with exercise has been found to show improvements in body composition, muscle function and well being in Patients with COPD (Creutzberg et al 2003). www.bapen.org.uk/must_tool.html

References:


www.doh.gov.uk/essenceofcare/index.htm


www.bapen.org.uk


Ferreira et. al. Nutritional Support for Individuals With COPD -A Meta-analysis

CHEST March 2000, 117 (3 ) 672-678


www.nice.org.uk


5.4 Speech and Language Therapist (SLT)

Speech and Language Therapists (SLTs) assess, diagnose and treat swallowing, voice and communication disorders. SLTs play an important role in the management of COPD due to the prevalence of swallowing, reflux, vocal and oral hygiene issues associated with the disease.
If available and deemed necessary for the patient, the that Speech & Language Therapists provide input into Pulmonary Rehabilitation programmes so as to facilitate health promotion and disease prevention.

### 5.4.1 Dysphagia and COPD

Dysphagia (disorder of swallowing) can co-exist with COPD and is an under-diagnosed condition (Gross, Atwood, Olzewski & Eichorn, 2009). The prevalence is unknown (O’Kane & Groher, 2009). As swallowing and respiration involve the same anatomical structures, dysfunction in one may lead to compromised function in the other (Good-Fratturelli, Curlee & Holle, 2000; Gross et al, 2009). Recent years have seen developing research interest in the correlation between COPD and dysphagia, and in the relationship between dysphagia and increased exacerbations (Gross et al, 2009). This highlights the importance of interdisciplinary approaches to the management of COPD.

Anecdotal evidence suggests that people with COPD may not be aware that they have swallowing problems – possibly because chronic cough is hard to distinguish from coughing as a result of penetration or aspiration (Ilsley, 2011). Research results suggest an early intervention-based, educative approach, combined with specialist clinical assessment and management can improve patient insight into issues around eating, drinking and swallowing within COPD (RCSLT). McKinstry, Tranter and Sweeney (2010) described the benefits of SLT-based clinical assessment, education and prevention in a large scale pulmonary rehabilitation programme.

There is a high prevalence of gastro-oesophageal reflux disease (GORD) in the COPD population (Terada et al, 2010; Rodríguez, Ruigómez, Martín-Merino, Johansson & Wallander, 2008; Casanova, Baudet, del Valle Velasco, Martín, Aguirre-Jaime, Pablo de Torres & Celli, 2004). This can be a concomitant contributor to oropharyngeal dysphagia (Mendell & Logemann, 2002), and an exacerbating factor in respiratory decompensation (O’Kane & Groher, 2009).

### 5.4.2 COPD and Voice

COPD can affect vocal quality and production, both directly (associated with respiratory decline) and indirectly (as a side effect of medication or associated with concurrent symptoms). These voice problems (dysphonia) can vary between individuals depending on co-morbidities, prescribed medications, and severity of COPD. Despite the varying causes of voice problems associated with COPD, two common presentations are hoarseness (Rouey, Chakarski, Doskov,
Dimov & Staykova, 2005) and decreased volume (Martin-Harris, 2000). Oral health problems can also negatively impact on both swallowing and voice (Gallagher, 2010; Calverly, 2005).

Pathway of Management in Pulmonary Rehabilitation Programmes

Investigations for swallowing disorders should be considered in patients with COPD who have frequent acute exacerbations. Patients with stable COPD should also be considered for referral to SLT based on signs and symptoms suggestive of dysphagia.

Screening tools (Befalsky, Mouadeb, Rees, Pryor, Postma, Allen & Leonard, 2008; Ickenstein, Linder-Pfleghar, Prosiegel, Riecker, Stanschus, Weinert, 2011) can guide the appropriateness of referral of patients with potential, as well as actual dysphagia, on the basis that COPD changes over time and dysphagia within the disease may fluctuate. See Fig. 1

5.4.3 Speech & Language Therapists and Pulmonary Rehabilitation Programme

Patient education and the dissemination of screening tools for both swallowing and voice difficulties should be delivered as part of a comprehensive Pulmonary Rehabilitation programme. SLTs may deliver information sessions during the Pulmonary Rehabilitation programme with the aim of providing patients with:

- An understanding of the relationship between breathing and swallowing.
- An understanding of the mechanism of aspiration and swallowing problems in chronic obstructive pulmonary disease (COPD).
- The ability to understand and follow safe swallowing guidelines.
- Improved knowledge of oral care.
- An understanding of the relationship between COPD and voice disorders.
- An understanding of the cause of voice disorders in COPD.
- Strategies to maintain good vocal hygiene.
REFERENCES:


REFERENCES


8. Seymour JM, Moore L, Jolley CJ et al. Outpatient pulmonary rehabilitation following acute exacerbations of COPD. Thorax 2010; 65: 423-428

9. Murphy N, Bell C, Costello R. Extending a home from hospital care programme for COPD exacerbations to include pulmonary rehabilitation. Respiratory medicine 2005 99; 10: 1297-1302


23. Clarke CJ, Cochrane L, Mackey E. Low intensity peripheral muscle conditioning improves exercise tolerance and breathlessness in COPD. ERJ 1996 9:2590-2596


36 Royal College Physicians, Domiciliary oxygen therapy services: clinical guidelines and advice for prescribers report of a working party. 1999 (RCP London)


38. Seymour JM, Spruit MA, Hopkinson NS, Natarek SA, Man W D-C. The prevalence of quadriceps weakness in COPD and the relationship with disease severity. ERJ 2010;36:81-88


# APPENDIX 1 – Sample Referral and Assessment Forms

## 7.1 Pulmonary Rehab Referral Form

### Health Service LOGO  
**Pulmonary Rehabilitation Referral**

<table>
<thead>
<tr>
<th>Date of Referral:</th>
<th>Consultant:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td><strong>DOB</strong></td>
</tr>
<tr>
<td><strong>MRN</strong></td>
<td><strong>Phone Number:</strong></td>
</tr>
</tbody>
</table>

**Address:**

<table>
<thead>
<tr>
<th>Diagnosis:</th>
<th>Lung Function</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV1 &gt; 80%</td>
<td>GOLD I - Mild</td>
<td></td>
</tr>
<tr>
<td>FEV1 &gt; 50% - &lt;80%</td>
<td>GOLD II - Moderate</td>
<td></td>
</tr>
<tr>
<td>FEV1 &gt; 30% - &lt;50%</td>
<td>GOLD III - Severe</td>
<td></td>
</tr>
<tr>
<td>FEV1 &lt; 30%</td>
<td>GOLD IV - Very severe</td>
<td></td>
</tr>
</tbody>
</table>

**Inclusion Criteria** *(Please Tick)* ✓

1. Dx chronic respiratory disease *(e.g COPD, bronchiectasis, lung transplant candidates)*
2. No evidence of unstable asthma, ischaemic heart disease, decompensate/unstable heart failure, severe or uncontrolled systemic arterial hypertension, neuromuscular or musculoskeletal disorders or other disabling diseases that could resist exercise training.
3. No suspected underlying malignancy
4. Motivated to attend a 8 week outpatient exercise and education programme in a group setting.
5. Has the ability to exercise independently with supervision.

**Relevant Investigations.**

- CXR
- ABG
- ECG
- ECHO EF____% PAP’s____mmHg
- Other

**Optimization of respiratory medication per ITS/ICGP guidelines**  
- Yes  
- No

Please List medications:

**Have you discussed pulmonary rehabilitation with patient?**  
- Yes  
- No

**Will transport be required?**  
- Yes  
- No

**Smoking status:**  
- Current Smoker  
- Ex-smoker (≥12mths)  
- Never Smoked

**If smoker has patient been referred to Smoking Cessation Officer**  
- Yes  
- No

**LTOT:**  
- Yes  
- No  
- _____L 16 / 24 hr/day  
- Portable Oxygen  
- Yes  
- No  
- _____L

**Referring Health Professional**

**Name:**  

**Signature:**  

**Phone:**  

**Fax:**  

**Email:**  

---

45
## Pulmonary Rehabilitation Assessment Form

<table>
<thead>
<tr>
<th>Name:</th>
<th>Date of Assessment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOB:</td>
<td>Hospital No:</td>
</tr>
<tr>
<td>Address:</td>
<td>Medical Card No:</td>
</tr>
<tr>
<td></td>
<td>Tel No:</td>
</tr>
<tr>
<td></td>
<td>Mobile No:</td>
</tr>
<tr>
<td></td>
<td>Consultant:</td>
</tr>
<tr>
<td></td>
<td>GP:</td>
</tr>
</tbody>
</table>

### Respiratory Diagnosis:

### Other/Past Medical History:

### Social History

- Occupation:
- Mobility:
- Transportation:

### Medications:

### Baseline Respiratory Function:

- Mob Distance
- Stairs
- Uphill
- Orthopnoea
- Cough
- Sputum
- Wheeze
- Stress Incontinence
- Other

<table>
<thead>
<tr>
<th>Home O2:</th>
<th>Y</th>
<th>N</th>
<th>L/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable O2</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>L/min</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BiPAP:</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPAP:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPAP:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Home Nebs: | Y | N |
|            |   |   |

### Smoking History:

<table>
<thead>
<tr>
<th>Y</th>
<th>N</th>
<th>Ex</th>
<th>Pack Years</th>
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<table>
<thead>
<tr>
<th>BMI:</th>
<th>BORG:</th>
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</thead>
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<tr>
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<table>
<thead>
<tr>
<th>HEART RATE:</th>
<th>SaO2:</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>CXR Report:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Hospital No:</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Date</td>
<td>Initial</td>
</tr>
<tr>
<td><strong>Spirometry</strong></td>
<td></td>
</tr>
<tr>
<td>FEV1</td>
<td></td>
</tr>
<tr>
<td>FVC</td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td></td>
</tr>
<tr>
<td>% Predicted</td>
<td></td>
</tr>
<tr>
<td>DLCO</td>
<td></td>
</tr>
<tr>
<td>SNIP</td>
<td></td>
</tr>
<tr>
<td>PiMax</td>
<td></td>
</tr>
<tr>
<td>IC/TLC</td>
<td></td>
</tr>
</tbody>
</table>

The above PFT’s are a guide only and are adapted to requirements at a local level. If tests have been performed within 6 months of PRP repeat may not be necessary. A decision should be made at a local level.

**6MWT / ISWT**

<table>
<thead>
<tr>
<th>Distance</th>
<th>Borg</th>
<th>Heart Rate post</th>
<th>O2 Sats post</th>
</tr>
</thead>
</table>

**ESWT / Treadmill**

<table>
<thead>
<tr>
<th>Level / Speed</th>
<th>Minutes</th>
<th>Borg</th>
<th>Heart Rate post</th>
<th>O2 Sats post</th>
</tr>
</thead>
</table>

**CRDQ**

<table>
<thead>
<tr>
<th>Dyspnoea</th>
<th>Fatigue</th>
<th>Emotional Function</th>
<th>Mastery</th>
</tr>
</thead>
</table>

**SGRQ**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Activity</th>
<th>Impacts</th>
<th>Total</th>
</tr>
</thead>
</table>

**CAT (total)**

**HADS**

<table>
<thead>
<tr>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
</table>

**MRC**

<table>
<thead>
<tr>
<th>1 year pre prog</th>
<th>1 year post prog</th>
</tr>
</thead>
</table>

**No of Admissions**

**No of Hospital Days**
8 APPENDIX 2 - MCID SCORES

8.1 ISWT:

The minimum clinically significant improvement for the ISWT is 47.5 meters. In addition patients were able to distinguish and additional benefit at 78.7 meters

Singh et al thorax 2008

Outcome measure

- Improvement 47.5 meters means “slightly better”
- Improvement 78.7 meters represents “better” (Singh et al 2008)

8.2 6MWT:

An MCID value for 6mwt has been identified as 54 metres

Outcome measure

- Minimal improvement estimated at 35-54 meters (Redelmeier, 1997) (Puhan 2008)


8.3 Hospital anxiety and depression scale

MCID is around 1.5 in COPD patients corresponding to a change in baseline of around 20%


8.4 Chronic respiratory disease questionnaire

- Dysspnoea: 2.5  Fatigue: 2  Emotional Function: 3.5 Mastery: 2
- Guyatt GH, Berman LB, Townsend M, Pugsley SO, Chambers LW.
8.5 St George’s respiratory questionnaire.

Measures clinical significant changes- 4 u is significant.

References:


8.6 Euroqual /EuroQol

EQ-5D is a standardised instrument for use as a measure of health outcome. Applicable to a wide range of health conditions and treatments, it provides a simple descriptive profile and a single index value for health status.

8.6.1 EQ-5D

Descriptive system of health-related quality of life states consisting of five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) each of which can take one of three responses. The responses record three levels of severity (no problems/some or moderate problems/extreme problems) within a particular EQ-5D dimension.

EQ-5D is designed for self-completion by respondents and is ideally suited for use in postal surveys, in clinics and face-to-face interviews. It is cognitively simple, taking only a few minutes to complete. Instructions to respondents are included in the questionnaire.

If you have already seen EQ-5D and/or decided to go ahead and use it, please register your study first by completing the EQ-5D registration form. The EuroQol Executive Office will then contact you by e-mail and inform you about the terms and conditions which apply to your use of the EQ-5D, including licensing fees (if applicable). Please allow 3 working days to receive this reply.

Licensing fees are determined by the EuroQol Executive Office on the basis of the user information provided on the registration form. The amount is dependent upon the type of study, funding source, sample size and number of requested languages. You are not obligated to purchase by registering.

Please note that without the prior written consent of the EuroQol Executive Office, you are not permitted to i.e. use, reproduce, alter, amend, convert, translate, publish or make available in whatever way (digital, hard-copy etc.) the EQ-5D and related proprietary materials.

8.6.2 How to use EQ-5D
The EQ-5D self-report questionnaire (EQ-5D) essentially consists of two pages comprising the EQ-5D descriptive system (page 2) and the EQ VAS (page 3). There is also an optional page of demographic questions. There is also an extended version of EQ-5D that incorporates the valuation task but this is only used for valuation studies and is not relevant for clinical users.

EuroQoL in assessment of the effect of pulmonary rehabilitation COPD patients

Contact information

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Authors

By: Ringbaek,T., Brondum,E., Martinez,G., Lange,P.

Published

31-10-08

Journal

DA - 20081117IS - 1532-3064 (Electronic)IS - 0954-6111 ...

8.7 CATS

2 point change clinically significant

Reference:

## Appendix 3 – Performance Reporting

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Anxiety
Reviewer Statement

Reviewer: The purpose of this statement is to ensure that a Policy, Procedure, Protocol or Guideline (PPPG) proposed for implementation in the HSE is circulated to people who have a stake in the PPPG, in advance of approval of the PPPG. You are asked to sign this form to confirm to the committee developing this Policy or Procedure or Protocol or Guideline that you have seen and agree to the following Policy, Procedure, Protocol or Guideline:

**Pulmonary Rehabilitation Model of Care**

I acknowledge the following:

- I have been provided with a copy of the Policy, Procedure, Protocol or Guideline described above.
- I have read the Policy, Procedure, Protocol or Guideline document.
- I agree with the Policy, Procedure, Protocol or Guideline and recommend its approval by the committee developing the PPPG.

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