

# **Pulmonary Rehabilitation Part One**

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## **Definition**

- ^ **Rehabilitation- restoration of an individual to the fullest medical, mental, emotional, social and vocational potential of which he or she is capable.**
- ^ **Rehabilitation - NOT a cure**

## **Learning Objectives:**

- ^ **Explain the goals and benefits of pulmonary rehabilitation (PR).**
- ^ **Select patients for PR.**
- ^ **Assess patients for PR.**
- ^ **Develop patient education for PR.**
- ^ **Recommend strategies for management of dyspnea.**
- ^ **Implement strategies for management of dyspnea.**

## **Definition**

- ^ **Pulmonary rehabilitation - An evidenced-based, multidisciplinary and comprehensive intervention for patients with chronic respiratory diseases who are symptomatic and often have decreased daily life activities.**

## **Definitions, Goals & Benefits**

## **Definition (cont'd)**

- ^ **Integrated into the individualized 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. (ATS, ERS 2006)**

### Definition components

- ▲ **Multidisciplinary:** Programs utilize expertise from various healthcare disciplines that is integrated into a comprehensive, cohesive program tailored to the needs of each patient.

### Goals

- ▲ **Reduce symptoms**
- ▲ **Optimize functional status**
- ▲ **Increase participation (patient)**
- ▲ **Reduce health care costs**

### Definition components

- ▲ **Individual:** Patients with disabling lung disease require individual assessment of needs, individual attention, and a program designed to meet realistic individual goals.

### Costs of COPD

- ▲ **COPD will cost \$176.6 billion in the U.S.A.... over the next five years, and \$389.2 billion over the next 10 years.**
- ▲ **COPD is the fourth leading cause of death in America, claiming the lives of 120,000 Americans in 2002.**
- ▲ **An estimated 10.7 million U.S.A. adults have COPD, but there may be many more undiagnosed cases.**

### Definition components

- ▲ **Attention to physical and social function:** To be successful, pulmonary rehabilitation pays attention to psychological, emotional, and social problems as well as physical disability, and helps to optimize medical therapy to improve lung function and exercise tolerance.

### Benefits of rehabilitation (COPD)\*

- ▲ **Cost-effectiveness**
- ▲ **Reduces utilization of healthcare services; e.g., hospitalizations**
- ▲ **Reduces dyspnea**
- ▲ **Improves health related quality-of-life (HRQoL)**

\*6-12 week rehabilitation program

### **Benefits of rehabilitation (COPD)\***

- ^ **Cost-effectiveness**
- ^ **Reduces utilization of healthcare services; e.g., hospitalizations**
- ^ **Reduces dyspnea**
- ^ **Improves health related quality-of-life (HRQoL)**
- ^ **Psychosocial improvement; e.g., reduces depression**
- ^ **May benefit patients with other pulmonary conditions**

### **Required components**

- ^ **Physician-prescribed exercise, including some aerobic exercise that must be included in each pulmonary rehabilitation session;**
- ^ **Education and training related to the individual patient's treatment and needs, including information on respiratory problem management and smoking cessation counseling, if needed;**

### **Sites for rehabilitation**

- ^ **Effectiveness of rehabilitation depends on the program, rather than the site**
- ^ **Hospitals**
  - ◆ **inpatient**
  - ◆ **outpatient**
- ^ **Home**

### **Required components**

- ^ **Psychosocial assessment;**
- ^ **Outcomes assessment; and**
- ^ **Treatment plan detailing how the components are used for each patient.**

### **Rehabilitation team**

- ^ **Physician**
- ^ **Respiratory therapist**
- ^ **Rehabilitation nurse**
- ^ **Physical therapist**
- ^ **Occupational therapist**
- ^ **Speech therapist**
- ^ **Social worker**
- ^ **Vocational counselor**
- ^ **Psychologist**
- ^ **Dietitian/nutritionist**

**Patient Selection  
& Assessment**

### Conditions managed

- ^ **Obstructive diseases**
  - ◆ COPD, emphysema
  - ◆ Persistent asthma
  - ◆ Bronchiectasis
  - ◆ Cystic fibrosis
  - ◆ Bronchiolitis obliterans

### Patient selection

- ^ **Patients with chronic respiratory impairment who, despite optimal medical management, have:**
  - ◆ dyspnea,
  - ◆ reduced exercise tolerance, or
  - ◆ restricted activities of daily life (ADL)

### Conditions managed

- ^ **Restrictive diseases**
  - ◆ Interstitial lung disease; e.g., fibrosis, occupational lung diseases
  - ◆ Chest wall diseases; e.g., kyphoscoliosis

### Patient selection

- ^ **Patients with chronic respiratory impairment who, despite optimal medical management, have:**
  - ◆ dyspnea,
  - ◆ reduced exercise tolerance, or
  - ◆ restricted activities of daily life (ADL)
  - ◆ peripheral muscle weakness
  - ◆ impaired physical activity
  - ◆ impaired occupational performance
  - ◆ impaired ADL
  - ◆ increased medical resource usage

### Conditions managed

- ^ **Neuromuscular diseases; e.g., post-polio syndrome, ALS**
- ^ **Other conditions**
  - ◆ lung cancer
  - ◆ pulmonary hypertension
  - ◆ pre-post lung transplantation, lung volume reduction surgery

### Patient selection

- ^ **Pulmonary lab data**
  - ◆  $FEV_1 < 80\% \text{ pred}$
  - ◆  $FEV_1/FVC < 70\% \text{ pred}$
  - ◆  $DLCO < 65\% \text{ pred}$
  - ◆  $\text{Resting SPO}_2 < 90\%$
  - ◆  $\text{Exercise SPO}_2 < 90\%$

### Exclusion criteria

- △ **Conditions that impede cooperation with rehabilitation interventions:**
  - ◆ orthopedic impairment
  - ◆ psychiatric impairment
  - ◆ neurologic impairment
- △ **Unstable cardiac disease**
- △ **Severe pulmonary hypertension**
- △ **Active smoking - controversy, whether cessation is a prerequisite or goal**

### Patient assessment

- △ **Exercise testing**
  - ◆ **medical status must be optimized before exercise testing**
  - ◆ **intended to establish baseline measurements**
  - ◆ **tests**
    - ▶ 6 minute walk test (6MWT)
    - ▶ cardiopulmonary exercise testing (CPET) - more objective measures

### Patient assessment

- △ **Initial interview**
  - ◆ explain rehabilitation process
  - ◆ establish patient's goals
  - ◆ establish trust & credibility
- △ **Medical history & physical examination**

### Patient assessment

- △ **Activities of daily living (ADL)**
  - ◆ **activity categories**
    - ▶ mobility; e.g., walking, stair-climbing
    - ▶ domestic work; e.g., cooking, lifting
    - ▶ personal hygiene; e.g., bathing
    - ▶ leisure activities
    - ▶ sexual activity

### Patient assessment

- △ **Symptoms**
  - ◆ dyspnea - later section
  - ◆ cough
  - ◆ sputum production
  - ◆ chest pain
  - ◆ weakness, fatigue
  - ◆ loss of appetite
  - ◆ sleep disturbances

### Patient assessment

- △ **Activities of daily living (ADL)**
  - ◆ **Bathing: The ability to clean oneself and perform grooming activities like shaving and brushing teeth.**
  - ◆ **Dressing: The ability to get dressed by oneself without struggling with buttons and zippers.**

## Patient assessment

### ^Activities of daily living (ADL)

- ◆Eating: The ability to feed oneself.
- ◆Transferring: Being able to either walk or move oneself from a bed to a wheelchair and back again.
- ◆Toileting: The ability to get on and off the toilet.
- ◆Contenance: The ability to control one's bladder and bowel functions.

## Patient assessment

### ^Nutritional status

- ◆important predictor of mortality
- ◆weight gain is associated with decreased mortality
- ◆parameters
  - ▶ weight loss/gain
  - ▶ albumin levels
  - ▶ free fat mass

## Patient assessment

### ^Zero ADLs - couch potato



## Patient assessment

### ^Education - the core of rehabilitation

- ◆rationale - to determine individual content and instructional methods
- ◆parameters
  - ▶ reasoning skills
  - ▶ literacy
  - ▶ current knowledge of disease and management
  - ▶ sensory acuity - vision & hearing
  - ▶ language/cultural barriers
  - ▶ technical skills; e.g., computer literacy

## Patient assessment

### ^Activities of daily living (ADL)

- ◆measurement methods
  - ▶ structured interview
  - ▶ questionnaire
  - ▶ on-site video recording
  - ▶ motion detectors
  - ▶ activity monitors; e.g., pedometer

## Patient assessment

### ^Education

- ◆assessment methods
  - ▶ interview
  - ▶ Pulmonary Rehabilitation Knowledge Test
  - ▶ attained education level

## Patient assessment

### ^ Psychosocial

#### ◆ parameters

- ▶ perception of disease
- ▶ perception of quality-of-life (QOL)
- ▶ self-efficacy
- ▶ motivation
- ▶ substance abuse
- ▶ psychological impairment
- ▶ marital relations

## Goals:

- ^ Improve health behaviors.
- ^ Encourage physical fitness.
- ^ Improve the patient's quality of life.
- ^ Increase the patient's ability to cope with their condition
- ^ Reduce hospital admissions and length-of-stay (LOS)
- ^ Optimize nutritional status.

## Patient assessment

### ^ Psychosocial

#### ◆ assessment methods

- ▶ interview
- ▶ St George Respiratory Questionnaire (QOL)

## Special considerations

- ^ Adult learners
- ^ Variable entry-level knowledge and physical capabilities
- ^ Hypoxemia impairs memory
- ^ Variable learning skills
- ^ Variable learning styles/preferences
- ^ Variable endpoint capabilities
- ^ Family member(s) may be integrated into program

Click for video on adult education (2.6 min)

[http://www.youtube.com/watch?v=Cu\\_PpkqWJGA](http://www.youtube.com/watch?v=Cu_PpkqWJGA)

## Education In Rehabilitation

## Implications

- ^ Relevance of instruction must be clear
- ^ Objectives must be clear
- ^ Frequent repetition & reinforcement may be necessary (patience)
- ^ Patient should be active participant

Click for video on communication with disabled (6.2 min)

<http://www.youtube.com/watch?v=9fCYYPctHGs>

### Implications

- ^ Instruction should be individualized for:
  - ◆ entry-level comprehension
  - ◆ rate of instruction
  - ◆ cognitive capabilities
  - ◆ literacy
  - ◆ sensory capabilities

### Instructional topics

- ^ Lung function with COPD
- ^ Medications - purposes, effects, side effects, self-administration
- ^ Breathing techniques
- ^ Physical exercise
- ^ Healthy eating
- ^ Recognizing and managing exacerbations
- ^ Coping with disease; i.e., managing depression, anxiety and panic attacks.

### Entry level skills assessment

- ^ Reasoning skills
- ^ Comprehension of disease and management
- ^ Literacy
- ^ Sensory acuity - vision & hearing
- ^ Language/cultural barriers
- ^ Technical skills; e.g., computer literacy

### Instructional topics

- ^ Oxygen therapy
- ^ Smoking cessation
- ^ Sputum clearance
- ^ Energy conservation techniques
- ^ Sexuality issues
- ^ Community resources, legal issues and palliative care

### Instructional topics

- ^ Lung function with COPD
- ^ Medications - purposes, effects, side effects, self-administration
- ^ Breathing techniques
- ^ Physical exercise

### Instructional methods

Lesson plan is imperative

Lesson plan stages

- I. Preparation (of learner)
- II. Presentation or demonstration
- III. Application
- IV. Verification
- V. Summary & review

### Instructional strategies

- ^ Live lecture/demonstration
- ^ Distance learning; e.g., web-based instruction
- ^ Guided practice
- ^ Printed media
- ^ Electronic media
- ^ Group discussions
- ^ Simulations/games

### Dyspnea definition (ATS)

"Dyspnea is a term used to characterize a subjective experience of breathing discomfort that is comprised of qualitatively distinct sensations that vary in intensity. The experience derives from interactions among multiple physiological, psychological, social, and environmental factors, and may induce secondary physiological and behavioral responses."

### Assessment of learning

- ^ Need to confirm enabling objectives before proceeding
- ^ Formal or informal
- ^ Methods
  - ◆ conversation
  - ◆ oral questioning
  - ◆ written examination
  - ◆ learner demonstration - motor skills
  - ◆ group discussion
  - ◆ scenarios/simulation
- ^ Document the formal assessments

### Importance of dyspnea

- ^ Dyspnea warns individuals of risk that ventilation may be inadequate.
- ^ Presents limitations to physical activity that result in muscular atrophy, anorexia, general debilitation

## Dyspnea Assessment & Management

### Mechanisms for dyspnea

- ^ Multidimensional sensation
  - ◆ physiological factors
  - ◆ psychological factors
- ^ Qualitative categories (sensations)
  - ◆ air hunger; e.g., congestive heart failure
  - ◆ excessive effort; e.g., COPD, interstitial lung disease
  - ◆ chest tightness; e.g., asthma

## Mechanisms for dyspnea

### ^ Stimuli

- ◆ increased demand for ventilation; e.g., hypoxia, exercise
- ◆ increased impedance and effort required to ventilate; e.g., bronchoconstriction
- ◆ altered perception of dyspnea; e.g., anxiety

## Assessment of dyspnea

- ^ Respiratory distress - the degree to which the symptom bothers the patient
- ^ Problem: Discrepancies between intensity of dyspnea and severity of disease exist, due to:
  - ◆ affect; e.g., stoicism, emotions
  - ◆ metabolic cost of exercise; e.g., due to weight, deconditioning

## Mechanisms for dyspnea

### ^ Sensors

- ◆ central & peripheral chemoreceptors
- ◆ facial, upper airway vagal receptors
- ◆ metaboreceptors - skeletal muscles
- ◆ parenchymal vagal receptors
  - slowly adapting stretch receptors
  - rapidly adapting stretch receptors
  - C fiber receptors (AKA J receptors)
- ◆ chest wall receptors

## Assessment of dyspnea

- ^ Unidimensional instruments - real-time dyspnea during exercise
  - ◆ Modified Borg scale
  - ◆ Modified medical research council (MMRC) dyspnea scale
  - ◆ Visual analog dyspnea scale

## Mechanisms for dyspnea

^ Brain areas activated by dyspnea signals are also activated by other unpleasant sensations; e.g., pain









### ^ Brain signals to:

- ◆ motor cortex - ventilatory muscle activation
- ◆ sensory cortex - conscious awareness of breathing effort

## Assessment of dyspnea

### ^ Modified Borg scale

Modified Borg Dyspnoea Scale

0	NOTHING AT ALL	
0.5	VERY, VERY SLIGHT (just noticeable)	
1	VERY SLIGHT	
2	SLIGHT	
3	MODERATE	
4	SOMEWHAT SEVERE	
5	SEVERE	
6		
7	VERY SEVERE	
8		
9	VERY, VERY SEVERE (almost maximal)	
10	MAXIMAL	

## Assessment of dyspnea

- ▲ **Multidimensional instruments**
  - ◆ greater validity & reliability
  - ◆ interview regarding recalled dyspnea during activities
  - ◆ measure functional impairment and magnitude of effort

## Treatment of dyspnea

- ▲ **Strategy categories**
  - ◆ Reduce sense of effort & improve ventilatory muscle function
  - ◆ Decrease ventilatory drive
  - ◆ Alter central perception
  - ◆ Exercise training

## Assessment of dyspnea

- ▲ **Multidimensional instruments**
  - ◆ Baseline/transitional dyspnea index (BDI/TDI)
  - ◆ UCSD shortness of breath and pulmonary functional status and shortness of breath questionnaire

## Treatment of dyspnea

- ▲ **Reducing sense of effort & improve ventilatory muscle function**
  - ◆ energy conservation - self-pacing, eliminating unnecessary tasks
  - ◆ decreasing dyspnea during sex - O<sub>2</sub>, timing before meals, positioning, etc.

## Assessment of dyspnea

- ▲ **Considerations**
  - ◆ instrument validity & reliability
  - ◆ terminology used
  - ◆ time to complete
  - ◆ established minimally clinically important differences
  - ◆ cost of instrument - generic ones are free

## Treatment of dyspnea

- ▲ **Reducing sense of effort & improve ventilatory muscle function**
  - ◆ breathing strategies
    - ▶ pursed lip breathing
    - ▶ abdominal (diaphragmatic) breathing
    - ▶ efficient breathing pattern - slow and deep for obstructive disease

Click for video on pursed lip breathing (2.7 min)  
<https://www.youtube.com/watch?v=7kpJ0QIRss4>

Click for video on diaphragmatic breathing (4.3 min)  
[http://www.youtube.com/watch?v=C\\_4E\\_QoDRSQ](http://www.youtube.com/watch?v=C_4E_QoDRSQ)

### Treatment of dyspnea

- △ Reducing sense of effort & improve ventilatory muscle function
  - ◆ positioning - postural support of breathing
  - ◆ nutrition & eating
    - ▶ meal planning for appropriate weight
    - ▶ low carbohydrate
    - ▶ O<sub>2</sub> during meals
    - ▶ smaller portions, greater frequency

### Treatment of dyspnea

- △ Decrease afferent stimuli from peripheral receptors
  - ◆ chest wall vibration in phase with inspiration
  - ◆ fans - cool air to face stimulates vagal receptors
  - ◆ inhaled opiates - terminal phase
  - ◆ inhaled furosemide - action uncertain, for exertional dyspnea, cancer

### Treatment of dyspnea

- △ Reducing sense of effort & improve ventilatory muscle function
  - ◆ inspiratory muscle training - conditions muscles for greater efficiency
  - ◆ bronchodilator therapy - decreases ventilatory impedance
  - ◆ heliox
  - ◆ lung volume reduction surgery - decreases hyperinflation

### Treatment of dyspnea

- △ Alter central perception
  - ◆ education
    - ▶ dyspnea management
    - ▶ relaxation techniques
    - ▶ breathing re-training
    - ▶ panic control

### Treatment of dyspnea

- △ Decrease ventilatory drive
  - ◆ oxygen therapy
  - ◆ CNS medications
    - ▶ opiates and sedatives
    - ▶ anxiolytics; e.g., benzodiazepines
    - ▶ antidepressants

### Treatment of dyspnea

- △ Alter central perception
  - ◆ biofeedback
    - ▶ patient monitors physiologic data
    - ▶ patient adjusts breathing in response to biofeedback
  - ◆ music
    - ▶ distraction from perceived ventilatory effort
    - ▶ lacks evidence

## Treatment of dyspnea

- ^ Alter central perception
  - ◆ acupuncture/acupressure - lacks evidence
  - ◆ social support
    - stress buffer
    - maintenance of exercise, etc.

## Summary & Review

- ^ Patient selection
  - ◆ Conditions: COPD; asthma; restrictive diseases AND
    - dyspnea, impaired ADL, etc.
    - PFT data; e.g., FEV<sub>1</sub> < 80%
  - ◆ Exclusionary criteria - orthopedic, psychiatric impairment

## Treatment of dyspnea

- ^ Exercise training - critical to dyspnea management
  - ◆ benefits
    - enhances strength and efficiency of peripheral muscles
    - increases self-efficacy (can do!)
  - ◆ exercises
    - upper and lower body
    - yoga, tai chi, dancing

FYI - click to see COPD exercise  
<http://www.youtube.com/watch?v=Rg887SYsLvE&feature=related>

## Summary & Review

- ^ Patient assessment
  - ◆ symptoms
  - ◆ exercise testing - 6 MWT, vs. CPET
  - ◆ ADLs - categories, measurement methods
  - ◆ nutritional status; e.g., weight loss
  - ◆ education - parameters, methods
  - ◆ psychosocial parameters, methods

## Summary & Review

- ^ Definition - restoration to maximum function
- ^ Goals - reduce symptoms, optimize function, increase participation, reduce costs
- ^ Benefits; e.g., cost effectiveness, improved HRQoL
- ^ Rehabilitation sites
- ^ Rehabilitation team
- ^ Required components

## Summary & Review

- ^ Education - critical component
  - ◆ goals - improve behaviors, fitness, etc.
  - ◆ considerations - adult learners
  - ◆ entry-level assessment
  - ◆ instructional topics; e.g., disease, drugs, exercises
  - ◆ instructional methods - lesson planning
  - ◆ instructional strategies
  - ◆ assessment of learning

## Summary & Review

- ^ **Dyspnea assessment & management**
  - ◆ definition - subjective, breathing discomfort
  - ◆ importance - warning
  - ◆ mechanisms - multidimensional
  - ◆ assessment - unidimensional vs. multidimensional instruments

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## Summary & Review

- ^ **Dyspnea management strategies**
  - ◆ reduce effort & improve ventilatory muscle function
  - ◆ decrease ventilatory drive
  - ◆ alter central perception
  - ◆ exercise training

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