Physical Therapy Management of Chronic Diseases: COPD & CHF

Suzanne Greenwalt, PT, DPT, CCS, GCS

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Statistics

- Chronic diseases were the leading causes of death among U.S. adults aged 65 or older in 2007-2009 (CDC, 2013)
- Among those chronic diseases, heart disease was the #1 cause of death and respiratory disease was the #3 leading cause of death in those 65 and older (CDC, 2013)
- As the aging population increases in the US, the prevalence of chronic heart and respiratory disease is also increasing
Statistics (CDC, 2013)

- More than 2/3 of all health care costs are for treating chronic illnesses
- 95% of the cost of health care in older adults in the US is in managing chronic diseases, the majority of which are cardiopulmonary in nature
In 2012, the Center for Medicare and Medicaid Services (CMS) established the Hospital Readmissions Reduction Program

- Program was designed to reduce frequent hospital readmissions for older adults in the US with chronic diseases
- CMS reduced payments to hospitals with excessive readmissions
  - This includes if a patient is readmitted to the hospital within 30 days of their last admission
  - A formula is used to compare a hospital's readmissions to the national average and then reductions in payment are made accordingly
  - Two of the diagnoses included in this are: COPD and CHF
Statistics

What does this mean for rehab professionals?

- All rehab professionals must take an active role in chronic disease management at all levels of care: acute, skilled nursing facilities, home health, outpatient.
- These diseases and comorbidities can not be ignored!
- Rehab professionals have the ability to aid in reducing hospital readmissions, improving quality of life and improving health care costs for those with chronic cardiac and pulmonary diseases.
WHAT IS COPD?
COPD  Chronic Obstructive Pulmonary Disease

- **Obstructive Pulmonary Disease**
  - Any diseases of the airway that produce restriction to expiratory airflow, which relates to:
    - Retained secretions
    - Inflammation of the mucosal lining of airway walls
    - Bronchial constriction related to increased tone or spasm of bronchial smooth mm
    - Weakening of the support structure of airway walls
Obstructive Pulmonary Disease

- **Chronic Bronchitis**
- **Emphysema**
- **Asthma**
  - Airway resistance caused by constriction of the bronchial smooth muscle cells and mucus production within the airway
- **Cystic Fibrosis**
  - Affects every organ system that has epithelial surfaces – most predominant systems are the lungs and the pancreas
  - Pulmonary system is affected with chronic obstruction and inflammation, thick mucus, and recurrent bacterial infections.
  - Pancreas develops exocrine pancreatic insufficiency which effect GI function (fat maldigestion) and growth and development
- **Bronchiectasis**
  - Irreversible dilation of one or more bronchi with chronic inflammation and infection
COPD

- Chronic Bronchitis
- Emphysema
- Both!
Emphysema

- Emphysema: permanent enlargement of the bronchioles and destructive changes in the alveoli
  - Loss of elastic recoil of lungs
  - Excessive collapsing of airways upon exhalation
  - Chronic airflow obstruction
Emphysema

- **Signs and Symptoms of Emphysema:**
  - Dyspnea (most common symptom)
  - Breathe with accessory muscles of respiration
  - Wheezing
  - Breathe through pursed lips on expiration
  - Rapid and shallow respirations
  - Tripod positioning

- **Other Characteristics:**
  - Little to no sputum production
  - Thin with elevated shoulders
  - Increased anterioposterior chest diameter
Emphysema
Chronic Bronchitis

- Disease process that is caused by long-term irritation of the tracheobronchial tree
  - Cigarette smoke
  - Environmental pollutants
  - Occupational irritants

- Chronic bronchitis: diagnosis is based on symptoms
  - Chronic or productive cough on most days for minimum of 3 months/year in >2 consecutive years
Chronic Bronchitis

- **Signs & Symptoms:**
  - Chronic productive cough
  - Increased sputum production
  - DOE
  - Frequent respiratory infections
  - Cyanosis
  - Decreased capillary refill
  - Clubbing fingers
  - Decreased vital capacity due to increased residual volume
More Signs & Symptoms:

- Auscultation of the lungs will show a prolonged expiratory phase.
  - Normal exhalation is 4 seconds, expiration >4 seconds is indicative of significant obstruction
- Breath sounds are diminished
- Chest becomes barrel shaped
- Flattening of the diaphragm
- May see jugular vein distension and ankle/lower leg swelling when cor pulmonale is present
Fig. 6-15. Mechanisms of air trapping in chronic obstructive pulmonary disease (COPD). Mucous plugs and narrowed airways cause air trapping and hyperinflation on expiration. During inspiration the airways are pulled open, allowing gas to flow past the obstruction. During expiration decreased elastic recoil of the bronchial walls results in collapse of the airways and prevents normal expiratory airflow.
COPD


- In addition to the lung abnormalities COPD causes, it also causes significant systemic effects
  - Cardiovascular disease – most significant nonrespiratory contributor to death in COPD
    - Includes HTN, CAD, heart failure
  - Skeletal muscle dysfunction: reduced peripheral muscle mass, skeletal muscle wasting and overall dysfunction
    - Leads to reduced exercise capacity
  - Osteoporosis
  - Lung Cancer
COPD

- Patients with COPD often retain CO2 – monitor them carefully
- Those with CO2 retention have a decreased ventilatory drive unless oxygen levels are low
- Oxygen through a nasal cannula can not get too high or they will become apneic
- Maintaining levels around 1-2 L/minute may be required with some of these patients
- May even see an increase in oxygen saturation levels with a decrease in supplemental oxygen
COPD PATIENT ASSESSMENT
Components of Patient Assessment

- Vital Signs
- COPD Assessment Tool
- Physical Appearance
- Breathing Patterns
- Functional Assessments
- Strength and Flexibility
Vital Signs

- Heart Rate
- Blood pressure
- Respiratory rate
- Oxygen saturation level
  - If oxygen saturation levels are less than 88% then a patient with COPD is a candidate for supplemental oxygen
  - The average “normal” range for a patient with COPD is 88-92%
Patient Questionnaire

• COPD Assessment Tool (CAT)
  ◦ Standardized questionnaire that evaluates the impact that COPD has on a patient’s daily life
  ◦ This test should be administered during a patient’s rehab admission
    • Upon admission
    • Prior to discharge
  ◦ There is a maximum of 40 points on the test
  ◦ COPD management guidelines do exist based on the score obtained
  ◦ Research is ongoing to determine the Minimally Clinically Important Difference (MCID)
    • Appears to be 2 but more research is needed
Physical Appearance

- What would you expect posture to look like?

- Do patients with emphysema and chronic bronchitis look the same?
Breathing Patterns

- **Pursed lip breathing** – clinical sign of COPD, is performed to alleviate the trapping of air in the lungs and to improve gas exchange
  - Patients breathe out against lips that are mostly closed and shaped in a circular fashion
  - Used to decrease symptoms of dyspnea
  - Slows down respiratory rate, decreases pressure and reduced airway collapse during expiration

Fig. 16-7. Demonstration of pursed-lip breathing and its effects in patients with emphysema. The weakened bronchial airways are kept open by the effects of positive pressure created by the pursed lips during expiration.

Breathing Patterns

- Paradoxical breathing:
  - Abnormal chest movement where the chest moves inward during inhalation rather than outward.
  - This abnormal movement impairs the ability to effectively inhale, limiting the amount of oxygen you can take in.
  - Patients will then have to actively contract the abdominal musculature during expiration to decrease the air trapped in the lungs – this results in the chest moving outward.

- This abnormal breathing pattern is an indicator of advanced COPD.
Breathing Patterns

- Accessory Muscle Use
Functional Assessments

- BORG
- Ventilatory Response Index
- 6 Minute Walk Test
- Gait Velocity
- 2 Minute Step Test
BORG

- Used to assess a patient’s level of dyspnea
- Can be used in writing goals, tracking progress of treatment
BORG vs. Modified BORG

BORG (6-20)

Modifed BORG (1-10)
Ventilatory Response Index (VRI)

- Uses a scale from 0-4
- Assesses how many breaths a patient needs to take in order to count aloud to 15
- There are not specific norms
- Each number should be said in .5 seconds (total time = 7.5 seconds)
## Ventilatory Response Index

<table>
<thead>
<tr>
<th>VRI Level</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>Needs no additional breaths in order to complete counting aloud to 15</td>
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<tr>
<td>1</td>
<td>Needs to take 1 breath in order to complete counting aloud to 15</td>
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<td>Needs to take 2 breaths in order to complete counting aloud to 15</td>
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<tr>
<td>3</td>
<td>Needs to take 3 breaths in order to complete counting aloud to 15</td>
</tr>
<tr>
<td>4</td>
<td>Needs to take 4 or more breaths in order to complete counting aloud to 15</td>
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</table>
6 Minute Walk Test

- **6 Minute Walk Test**
  - Tests for exercise capacity and endurance
  - “Valid and reliable test when assessing exercise capacity in older patients with chronic heart failure, those in phase II/III cardiac rehabilitation programs and patients with COPD.” Lewis & Shaw, 2005
  - Walk as far as possible in 6 minutes
  - Have a 100 ft (30 meter) course designated so that patient turns around each 100 feet
  - Patient begins test from a seated position – there is no warm up phase to this test
  - Instruct patient not to talk when walking
  - Use standardized phrases when the patient is walking: “Keep up the good work” or “You are doing great”
## 6 Minute Walk Test


<table>
<thead>
<tr>
<th>Age</th>
<th>Gender (N)</th>
<th>Mean</th>
<th>SD</th>
<th>Normal Range (2SD)</th>
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<tbody>
<tr>
<td>60-69</td>
<td>Male (15) Female (22)</td>
<td>572 m (1,877 ft.)</td>
<td>92 m</td>
<td>388-756 m</td>
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<td></td>
<td>538 m (1.765 ft.)</td>
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<td>354-722 m</td>
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<td>73 m</td>
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<td></td>
<td>392 m (1.286 ft.)</td>
<td>85 m</td>
<td>222-562 m</td>
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</tbody>
</table>
Gait Velocity

- Measures gait speed at preferred and maximum speeds
- Is an indicator for falls risk and home safety
- 6th vital sign
- >1.0 m/sec is doing well, means low fall risk
- <0.6 m/sec is at high risk for falls
- .4 m/sec or less are typically homebound
- Assistive devices can be used when measuring gait velocity
- 3.3 feet = 1 meter
Gait Velocity

- The patient is instructed to walk a set distance (6 meters, 10 meters, etc.)
  - 10 meter or 30 feet is typical distance used for test
- Time is measured while the individual walks the set distance (often the individual is given space to accelerate to his/her preferred walking speed (this distance is not included when determining speed).
- The distance covered is divided by the time it took the individual to walk that distance.
2 Minute Step Test

- Test for physical endurance
- Stand facing wall with line marked halfway between patella and iliac crest
- Count number of full steps completed in 2 minutes (number of times right knee reaches marked height)
- Less than 65 steps (men or women) is indicative of problem (in general)
- Measure HR, BP and RR prior to beginning test and after the test
# 2 Minute Step Test

## Norms

- Rickli & Jones, 1999

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-64</td>
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<td>75-107</td>
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</tr>
<tr>
<td>90-94</td>
<td>52-86</td>
<td>44-72</td>
</tr>
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</table>
Strength & Flexibility

- Upper extremity ROM and strength
- Trunk ROM and strength
- Lower extremity ROM and strength
TREATMENT OF COPD
Treatment of COPD

- Airway Clearance Techniques
- Breathing Techniques
- Positioning
- Incentive Spirometers
- Flexibility Exercises
- Strengthening
- Energy Conservation
- Patient/Family Education
Airway Clearance Techniques

- Manual or mechanical procedures that facilitate mobilization of secretions from the airways
- *Include:*
  - Percussion
  - Vibration
  - Postural Drainage
  - **Active cycle of breathing**
  - **Deep Breathing**
  - **Coughing**
  - **Positive Expiratory Pressure**
Airway Clearance Techniques

- **Indications**: impaired mucociliary transport, excessive pulmonary secretions, ineffective or absent cough
- Should be performed at least 30 minutes after a meal or tube feeding
- Inhaled bronchodilator medications should be given prior to airway clearance techniques to enhance overall outcome of intervention
- **Goals**: optimize airway patency, promote alveolar expansion and ventilation, and increase gas exchange
Airway Clearance Techniques

- Historically physical therapists addressed this with percussion, vibration and postural drainage
- Other devices and techniques have been shown to be as effective
- When trying to decide what method of secretion clearance to use, consider the following:
  - Is it adaptable
  - Can it be performed independently
  - Is it cost effective
  - Is it time efficient
Active Cycle of Breathing

- Effective form of airway clearance
  - Very effective way to clear excess bronchial secretions
- Active participation from the patient
- Cyclic repetition of 3 phases:
  1. breathing control
  2. thoracic expansion
  3. forced expiratory technique
Active Cycle of Breathing

- **Breathing Control**
  - Diaphragmatic breathing at a normal tidal volume
  - Rest one hand on the stomach and allow shoulders to relax
  - Breathe quietly and gently.
  - With inspiration the stomach should rise slightly, it should fall with expiration

- **Thoracic Expansion**
  - Deep inhalation with relaxed exhalation
  - Used to get air behind the sputum stuck in small airways
  - Relax upper chest
  - Breathe in slowly and deeply – will see rib cage expand laterally
  - Breathe out gently until your lungs are empty – don’t force the air out
Active Cycle of Breathing

- Forced Expiratory Technique
  - “huff” at mid to low lung volume followed by a forced expiration with abdominal muscle contraction
  - Huffing moves sputum from the small airways to the larger airways, from where they are removed by coughing. (Coughing alone does not remove sputum from small airways.)
  - Take a medium sized breath in
  - Squeeze the breath out by contracting abdominal muscles and keep mouth and throat open.
  - The breath should be prolonged, but don’t continue until the lungs are empty
  - Take a large breath in
  - Squeeze the air out as before
  - Cough and expectorate any sputum. If you don’t produce any sputum with 1 or 2 coughs, stop coughing and use breathing control
Active Cycle of Breathing

• Put it all together....

1. Perform breathing control
2. Follow it with 3-4 thoracic expansions
3. Then breathing control
4. Follow with 3-4 thoracic expansions
5. Then breathing control
6. Follow by forced expiratory technique
7. Lastly, breathing control
Active Cycle of Breathing

**Evidence Based Research for ACBT**

- Lewis, L. K., Williams, M. T., & Olds, T. S. (2012) performed a meta-analysis and the results revealed, "clinicians planning to use FET/ABCT as an airway clearance technique for short-term secretion removal can be confident of the efficacy of the technique in comparison with the other airway clearance techniques."

- Syed, N., Maiya, A. G., & Kumar, S. T. (2009), performed a study evaluating the effectiveness of ACBT as compared to traditional percussion and vibration techniques in bronchiectasis patients. Results showed, "ACBT ... is found to be equally effective as conventional chest physical therapy on airway clearance in patients with bronchiectasis. Patients have rated ACBT as more comfortable than conventional therapy, and hence can be used as preferred modality for airway clearance in bronchiectasis patients."

- Ides, K., Vissers, D., De Backer, L., Leemans, G., & De Backer, W. (2011), performed a systematic review of ACBT and found, "we conclude that it is recommended to use active airway clearance techniques ... to remove secretions in COPD patients"
Airway Clearance Techniques

- Deep breathing exercises
  - Aid in secretion clearance
  - Perform as described on the active cycle of breathing slides
Airway Clearance Techniques

- **Cough**
  - An effective cough is one of the best ways to clear the airway!
  - An initial intervention should be to make sure that patients are taught how to perform an effective cough and that they are proficient with it
    - Position the patient to allow for trunk extension and flexion
    - Inspiration – combine with trunk extension and UE elevation
    - Expiration – combine with trunk flexion and lowering UEs
    - Improve the inspiratory hold by giving VCs and by positioning
    - Maximize intrathoracic and intraabdominal pressures with mm contractions or trunk movement
Airway Clearance Techniques

• **Coughing continued….**
  - If a patient is unable to cough, then teach them to “huff”
  - Deep inspiration followed by forced expiration without glottis closure (as in coughing)
    - Often used in post-op patients when coughing would be too painful
  - Coughing exercises are beneficial after bronchodilator treatments or before or after each exercise session
Airway Clearance Techniques

- **Positive Expiratory Pressure (PEP) devices**
  - Devices that allow air pressure to build up distal to secretions
  - This is an effective way to move secretions into the upper airways for expelling
  - Help improve oxygenation and exercise tolerance
  - Examples:
    - Flutter®
    - Acapella™

- **Benefits:**
  - Patients can use independently
  - Can be used in acute or chronic phases of the disease
  - Easy and convenient
Airway Clearance Techniques

- Sustained aerobic exercise, if tolerated by the patient, can have very beneficial airway clearance effects.
Airway Clearance Techniques

Summary:
- Vibration
- Percussion
- Postural Drainage
- Active Cycle of Breathing
- Deep breathing
- Coughing
- PEP devices
- Aerobic exercise
Techniques to Control Dyspnea

- **Pursed Lip Breathing**
  - Used to decrease symptoms of dyspnea
  - Encourage patients to use this with exercise and activity

- **Paced Breathing**
  - Volitional control of breathing during activity
  - During rhythmic activities, coordinate the breathing with the rhythm of the activity
  - During non-rhythmic activities have the patient breathe in at the beginning of the activity and push out during the activity
  - This can help the patient with their feelings of dyspnea and to control their breathing
  - The basic concepts of paced breathing are inhale with rest and exhale with work; slow down, set priorities, get organized and take rest breaks
Techniques to Control Dyspnea

• **Inspiratory Hold Technique**
  
  ◦ Prolonged holding of breath at maximum inspiration
  ◦ Can be used in conjunction with vibration to aid in airway clearance
  ◦ Can improve flow of air to poorly ventilated regions of the lungs
  ◦ Patient is instructed to hold his or her breath at the peak of inspiration for 2-3 seconds and then do a relaxed exhale
Techniques to Control Dyspnea

- **Diaphragmatic Controlled Breathing**
  - Can be used to manage dyspnea, reduce atelectasis and increase oxygenation
  - Facilitating outward motion of the abdominal wall while reducing upper rib cage motion of the abdominal wall during inspiration
  - Instruct patients in this technique in all positions
  - Overall goal is to decrease use of accessory mm and increase the recruitment of the diaphragm
Techniques to Control Dyspnea

- **Diaphragmatic Controlled Breathing**
  - Position the patient with a posterior pelvic tilt to facilitate use of the diaphragm
  - Relax accessory mm through VCs
  - If desired breathing pattern is not noticed yet, instruct patient to “sniff” to help engage the diaphragm
  - Patients hands should be positioned on the abdomen for proprioceptive FB – patient is asked to sniff 3 times and exhale (feel for abdominal rise)
  - Will progress to 2 sniffs and then just one sniff and then progress to breathing in a relaxed manner
  - Semi-fowler and side-lying positions work well for this because they are gravity eliminated
Breathing Techniques for Dyspnea

- How do I know when to encourage a patient in a specific technique? Which one is best?
  - Be aware of what each is beneficial for
    - **Diaphragmatic Breathing** – manages dyspnea and improves oxygenation
    - **Expiratory Hold Technique** – gets air to poorly ventilated areas of the lungs and aids in airway clearance
    - **Paced Breathing** – controls dyspnea, especially during activity
    - **Pursed Lip Breathing** – aids in dyspnea, especially with activity and with emphysema
Positions to Relieve Dyspnea

Hillegass, E. (2011)
Positions to Relieve Dyspnea

- Semi-fowler's position (HOB elevated 45°)
  - Many cardiopulmonary patients may prefer

- Tripod Position
  - Leaning forward on supported hands
  - Intraabdominal pressures rise and the diaphragm is pushed up in a lengthened position
  - This position increase the strength/tension relationship of the diaphragm
  - The diaphragm has increased strength of contraction so the patient will feel relief from dyspnea
Incentive Spirometers

- Incentive spirometers are an effective way to practice diaphragmatic breathing, prevent or reduce atelectasis and stimulate a cough
  - Perform 10 reps every hour
  - Recommended for all patients post surgery because surfactant is reduced postoperatively which makes patients at increased risk for pneumonia and respiratory failure
  - Recommended for patients with a weak cough and weak abdominal muscles
- PTs need to encourage the use of these!!
Incentive Spirometer

Fig. 17-9. Patient using an incentive spirometer.
Flexibility & Strengthening

- Flexibility exercises should be included for posture, to increase joint ROM, and decrease stiffness.
- Trunk and UE flexibility are essential for breathing and coughing techniques.
- Full shoulder flexion and back extension performed with inspiration.
- Exercises with forward reaching and trunk flexion with unilateral or bilateral hip and lower trunk flexion may be combined with expiration.
Flexibility & Strengthening

- **Thoracic Mobilization Techniques**
  - If the mobility of the thorax is restricted it may be difficult for the patient to improve his or her breathing pattern through controlled breathing alone
  - Techniques to Mobilize the Thorax:
    - Place a towel roll vertically down the thoracic spine while the patient is in supine will improve anterior chest wall mobility
    - Place the patient in side-lying over a towel roll will increase lateral chest wall mobility
    - UEs can be actively or passively flexed to further stretch the trunk
    - PNF techniques:
      - D2 flexion – UE flex, abd, ER
      - D2 extension – UE ext, add, and IR
Flexibility & Strengthening

- Respiratory Muscle Training
  - Aerobic exercise training of the UE and LEs that is moderate to high intensity is an adequate stimulus to improve respiratory muscle endurance and strength.
  - Instruction in breathing re-training exercise, such as diaphragmatic breathing, can improve strength, awareness, coordination of the diaphragm muscle.
Flexibility & Strengthening

- Upper Body work and UE exercise....
  - Associated with high metabolic demand and ventilatory demand.
  - Activities involving the UEs can lead to irregular or dyssynchronous breathing (such as ADLS), therefore, it is important to incorporate UE exercise into the program.
  - Patients are more likely to hold their breath and develop dyspnea with upper body work.
  - Upper body resistance training is essential!
Flexibility & Strengthening

- Weight training should start with low resistance and progress repetitions first; increase to 20 reps before increasing resistance.

- E-stim can be used to increase muscle strength even in the absence of traditional cardiovascular exercise.
Energy Conservation

- Prioritize daily tasks
- In an inpatient setting nursing and therapy must coordinate daily activities
  - Patients can not be expected to take a shower, go to physical therapy and go to the dining room for lunch all back to back
PATIENT/FAMILY EDUCATION
Education

- Use of supplemental oxygen
  - Do the patients know when it is safe for them to turn up their oxygen and when it is not?

- Exercise program
  - Flexibility, strength, and aerobic exercise are essential in the management of COPD.
  - Patients need to be setup with daily home programs that are direct, efficient and reasonable

- Monitoring signs and symptoms of dyspnea
  - Use the BORG everyday with patients – when ambulating, when taking a shower, when getting dressed
  - Do they know what activities make their dyspnea worse?
  - Do they recognize the signs?
  - Have laminated BORG scales in every facility so that they can be used in therapy sessions
Education

- **Breathing techniques**
  - Do your patients know when to use PLB?
  - When should they use active cycle of breathing?
  - What works best for them and when?
  - Practice these daily so that they become independent

- **Coughing techniques**
  - Is their cough weak or strong?
  - If it is weak do they know to use trunk flexion and extension to enhance the force of the cough?

- **Positions for relief of dyspnea**
  - Practice dyspnea relief positions with COPD whenever they are having exacerbations
  - Before discharge from PT patients should know what positions provide them with the most relief
Break!!

YOU DON’T NEED TO BREATHE THAT DEEPLY!
WHAT IS CHF?
Understanding CHF

- It is characterized by the inability of the heart to maintain adequate cardiac output.
- Essentially, the heart muscle can not pump enough blood through the heart to meet the body’s needs for blood and oxygen.
Understanding CHF

- With heart failure the pumping action of the heart becomes less and less powerful.
- When this happens, blood does not move efficiently through the circulatory system and starts to back up.
- Symptoms depend on which area of the body is most involved in the reduced pumping action.
Understanding CHF

- Types of Congestive Heart Failure:
  - Left Side
  - Right Side
  - Diastolic
  - Systolic
Understanding CHF

**Left Side Heart Failure:**

- Left ventricle is unable to maintain normal cardiac output
- When the left side of the heart (left ventricle) starts to fail, fluid collects in the lungs – this is *pulmonary edema* or *congestion.*
Understanding CHF

- This extra fluid in the lungs makes it more difficult for the airways to expand as a person inhales.
- Breathing becomes more difficult and the person may feel short of breath, particularly with activity or when lying down.
- Fluid also diffuses into the pleural spaces and can cause *pleural effusion*
Understanding CHF

- **Right Side Heart Failure**
  - When the right side of the heart (right ventricle) starts to fail, fluid begins to collect in the feet and lower legs.
  - This usually occurs secondary to left side heart failure or if a right ventricular impairment is present (such as PE).
    - When right side of the heart fails due to left heart failure this is known as biventricular heart failure
  - Edema is a sign of right heart failure, especially if the edema is pitting edema.
Right Side Heart Failure

- As the right heart failure worsens, the upper legs swell and eventually the abdomen collects fluid - ascites.
- Weight gain accompanies the fluid retention and is a reliable measure of how much fluid is being retained.
- Jugular vein distension is common
- Right Side Heart Failure is referred to as Cor Pulmonale
Understanding CHF

- Clinical Presentation

<table>
<thead>
<tr>
<th>Left Side Heart Failure</th>
<th>Right Side Heart Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary Edema</td>
<td>Increased peripheral edema</td>
</tr>
<tr>
<td>Decreased Breath Sounds</td>
<td>Weakness</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Weakness</td>
<td>Enlarged Jugular Vein</td>
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<tr>
<td>Increased Resting HR</td>
<td>Abdominal Pain</td>
</tr>
<tr>
<td>Increased BP</td>
<td>Urinary Frequency</td>
</tr>
<tr>
<td>Cough</td>
<td>Ascites</td>
</tr>
</tbody>
</table>
Understanding CHF

- **Risk Factors:**
  - Smoking
  - Diabetes
  - Anemia
  - Psychological Stress
  - Alcohol and drug abuse
Understanding CHF

- **Systolic Heart Failure**
  - Impaired contraction of the ventricles during systole produces insufficient expulsion of the blood
  - This causes decreased stroke volume and decreased ejection fraction

- **Diastolic Heart Failure**
  - Inability of the ventricles to accept blood ejected from the atria during rest of diastole
  - Ejection fraction is not affected
Understanding CHF

- **Ejection Fraction**
  - Best indicator of cardiac function
  - Ratio or percentage of the blood volume ejected out of the ventricles relative to the blood volume received by the ventricles before contraction
  - Normal: 60-70%
  - A certain volume of blood must always remain in the ventricles in order for the myocardium to maintain a certain level of stretch
Understanding CHF

- **Other Signs and Symptoms....**
  - Crackles in the bases of the lungs
  - S3 Heart Sound
  - Weight gain
    - Greater than 3lbs per day is a concern
  - Sinus tachycardia
    - Body attempts to increase the delivery of fluid and oxygen to the peripheral tissues where it is needed; compounds the problem more and makes the heart work harder
  - Decreased exercise tolerance
    - Decreased blood flow to the muscles
CHF PATIENT ASSESSMENT
Patient Assessment

- NYHA Classification - The Stages of Heart Failure
  - In order to determine the best course of therapy, physicians often assess the stage of heart failure according to the New York Heart Association (NYHA) functional classification system. This system relates symptoms to everyday activities and the patient's quality of life.
## Patient Assessment

<table>
<thead>
<tr>
<th>Class</th>
<th>Patient Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class I (Mild)</strong></td>
<td>No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, or dyspnea (shortness of breath).</td>
</tr>
<tr>
<td><strong>Class II (Mild)</strong></td>
<td>Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, palpitation, or dyspnea.</td>
</tr>
<tr>
<td><strong>Class III (Moderate)</strong></td>
<td>Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, palpitation, or dyspnea.</td>
</tr>
<tr>
<td><strong>Class IV (Severe)</strong></td>
<td>Unable to carry out any physical activity without discomfort. Symptoms of cardiac insufficiency at rest. If any physical activity is undertaken, discomfort is increased.</td>
</tr>
</tbody>
</table>
Patient Assessment

- **Lab Values:**
  - BNP (B-type Natriuretic Peptide)
    - Hormone released from the heart when the ventricles are distended due to increased volume and pressure
    - Normal = <100
    - >400 = 95% chance of CHF
  - BUN and creatinine
    - Often increased with CHF
Patient Assessment

- Evaluation
  - Physical Appearance:
    - Peripheral edema
    - Jugular Vein distension
    - Posture
  - Mobility Assessment
  - ROM, strength
  - Peripheral pulses and overall circulation
  - Vital Signs
  - Edema assessment
  - Cardiopulmonary Activity Tolerance
Patient Assessment

- **Vital Signs**
  - Heart Rate
    - Pay attention to rate and rhythm
  - Blood pressure
  - Respiratory rate
  - Oxygen saturation level
    - >90%

*Is it necessary to monitor the pulmonary system or can you just do HR and BP?*
Patient Assessment

- Importance of Monitoring Vital Signs:
  - Screen for cardiovascular disease
  - Examine a patient’s tolerance or response to activity
  - Establish a baseline of function
Patient Assessment

- **Edema Assessment**
  - Pitting Edema Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+</td>
<td>Barely perceptible depression or pit</td>
</tr>
<tr>
<td>2+</td>
<td>Skin rebounds within 15 seconds to its original contour</td>
</tr>
<tr>
<td>3+</td>
<td>Skin rebounds within 15-30 seconds to its original contour</td>
</tr>
<tr>
<td>4+</td>
<td>Skin rebound takes greater than 30 seconds</td>
</tr>
</tbody>
</table>
Patient Assessment

- **Edema**
  - Girth measurements
    - Ankles: figure 8
    - Circumferential lower legs
    - Circumferential abdomen
Patient Assessment

- **Cardiopulmonary Activity Tolerance**
  - BORG Scale of Perceived Exertion
  - Gait Velocity
  - 6 Minute Walk Test
  - 2 Minute Step Test
  - Ventilatory Response Index (VRI)
Patient Assessment

- Strength
- Thorough mobility assessment
- Balance Assessment
TREATMENT OF THE PATIENT WITH CHF
Treatment of CHF

- Exercise
  - Resistance training, aerobic exercise and flexibility
- Functional Mobility
  - Think energy conservation and safety
  - Issue assistive devices as appropriate
    - Fluctuations in LE edema can impact balance and safety with mobility
- Patient Education
Treatment of CHF

• **Exercise**
  ◦ Monitor vital signs before, during and after exercise
  ◦ Be aware of other clinical signs – increased peripheral edema, dyspnea
  ◦ BORG scale of perceived exertion
Treatment of CHF

- Contraindications to Exercise
  - If HR is >100bpm before therapy they are (tachycardic)
  - Resting HR <50bpm
  - Resting systolic BP >200mmHg or <90mmHg
  - Resting diastolic BP >110mmHg
  - Oxygen saturations <90%
  - Cyanosis
  - Edema in patient with CHF and has gained 3lbs of weight in one day
  - Worsening dyspnea over 1-3 days
  - Class IV New York Heart Association CHF
Treatment of CHF

- Normal Responses to Exercise
  - Rise in SBP is proportional to the workload
    - With endurance exercise the SBP rises slowly for the first 2-3 minutes but then should remain level or decrease slightly
    - In general, with dynamic aerobic exercise, a rise of 20-30 mm Hg is normal
  - Diastolic blood pressure +/- 10 mm Hg
  - BP returns to within 10mmHG of pre-exercise level within 5 minutes of stopping the exercise
TREATMENT OF CHF

- Normal Responses to Exercise
  - HR gradually increases proportional to the workload
    - With low to moderate intensity exercise the HR rise should be fairly small: <20-40 beats/minute
    - HR response with exercise will be blunted in those taking Beta blockers
  - During static or isometric exercises the HR increase is less pronounced than with dynamic exercise due to reduced cardiac output requirements
  - HR should return to within 10bpm of pre-exercise within 5 min of stopping exercise
  - If elderly, HR response may be less brisk overall
Treatment of CHF

• Normal Responses to Exercise
  ◦ Rate of Perceived Exertion
    • RPE 13/20 (indicating moderate exercise)
    • Increases gradually in proportion to the progressive workload
    • Correlated highly with HR response
    • More rapid increase in RPE with gradually increasing workloads indicate marked impairment in exercise tolerance, which is often due to cardiovascular and pulmonary dysfunction
  ◦ Respiratory Rate
    • Gradually increases with exercise
Treatment of CHF

- **Exercise Recommendations**
  - **Aerobic activity** = moderate intensity for minimum of 30 minutes, 5 days/wk or vigorous activity for a minimum of 20 minutes 3 days/wk
  - **Muscle strengthening** = minimum of 2 days/wk, 8-10 exercises using the major mm groups (weight training, calisthenics) on non-consecutive days
  - **Flexibility exercises** = at least 2 days/wk for at least 10 min each day

- Recommendations from the American College of Sports Medicine and the American Heart Association
Treatment of CHF

- Exercise Prescription
  - When working with patients with CHF, therapists and other health care providers have to be able to prescribe the correct intensity of exercise.
  - Use the BORG Rate of Perceived Exertion Scale to determine how a patient is tolerating the exercises prescribed
    - Recommendation is that a patient with CHF should rate themselves from 11-14 (light to somewhat hard)
Treatment of CHF

- **Edema Management**
  - Compression stockings
    - Can make symptoms worse!
    - Must have clearance from cardiologist
  - Daily weight monitoring
    - Can the patient independently get on and off of the scale?
    - Can the patient see the scale?
    - Can the patient track their weight so that they understand if they have had a 3lb. weight gain that warrants calling their cardiologist?
Treatment of CHF

- Patient Education
  - Understanding of CHF
  - Medications
    - What they are taking, when they should take them, and why
  - Self monitoring during functional mobility activities and ADLS
    - BORG
  - Self monitoring of weight
Patient Education Regarding Lifestyle Changes

- Stress management and relaxation techniques
- Smoking cessation
- Diet: low fat, low cholesterol, low sodium, fluid restriction
- Home exercise programs and lifelong exercise programs – *ambulation is a very effective mode of exercise for CHF patients!*
Treatment of CHF

- Many patients with CHF will also develop COPD!
- Even in CHF patients who do not have COPD, breathing exercises are important!
  - Facilitation of diaphragmatic breathing and inhibition of accessory muscle use may decrease the work of breathing in CHF
  - Pursed lip breathing is effective in assisting with dyspnea management in those with CHF
Questions??

Suzanne Greenwalt, PT, DPT, CCS, GCS

Belmont University

Suzanne.greenwalt@belmont.edu
References


References

References


