Chronic obstructive pulmonary disease (COPD): exercise considerations and signposting for specialist pulmonary rehabilitation
Learning objectives

To understand the clinical significance of physical activity in the treatment and management of COPD

Learning Objectives

1. Understand the prevalence of the condition
2. Understand the role of physical activity and signposting to specialist exercise services (pulmonary rehabilitation)
3. Understand the non-specific benefits of physical activity
4. Review physical activity guidelines to provide “teachable moments” to COPD patients and referral opportunities
5. Review the literature, resources and support available for safe and effective patient care
Chronic Obstructive Pulmonary Disease (COPD)

- COPD leads to damaged airways and lung tissue, resulting in obstruction to airflow [British Lung Foundation]
- 1.6% of the UK population has diagnosed COPD, with another estimated 2 million undiagnosed (~3 million people) [NICE 2013]
- Many countries incidence as high as ~15% [HSE 2013]
- NHS costs £1.2 billion per year
- **Third biggest cause of death** globally by 2030 [WHO 2015]
Cycle of patient inactivity in COPD

You feel breathless

You become fearful of activity that makes you breathless

You avoid those activities which make you breathless

You do less activity

Your muscles become weaker

Potential social isolation and depression

Weak muscles use more oxygen and are less efficient

Physical activity level is the strongest predictor of all-cause mortality in patients with COPD

Waschki et al. 2011

...but physical activity and pulmonary rehabilitation can break the inactivity cycle!

Corhay et al. 2014

Waschki et al. 2011 Corhay et al. 2014  ACSM
Image adapted from the British Lung Foundation
Exercise benefits in COPD

- Improves $O_2$ uptake by increasing aerobic capacity
  - ↓$CO_2$ production from anaerobic metabolism & ↓ ventilatory requirements  
    Pascual-Guardia 2012

- ↓ minute ventilation, hyperinflation, and dyspnoea  
  FYSS 2011

- Reduces decline in FEV1*
  - slowing disease progression  
    Garcia-Aymerich et al 2007

- Improved cardiac function:  
  FYSS 2011
  - improved left ventricular function
  - increased stroke volume
  - reduced resting heart rate due to increased vagal tone

* FEV-1 = forced expiratory volume in one second

References:

Exercise benefits in COPD

- Decreases anxiety about breathlessness
- Improves independence, quality of life and fatigue
- Reduces the patient’s social isolation
- Lowers blood pressure
- Positively affects multiple co-morbidities
  - cardiac dysfunction
  - Type 2 diabetes
  - osteoarthritis
  - cardiovascular disease

NB: There is no evidence that physical activity prevents the onset of COPD

### What advice and to whom?

<table>
<thead>
<tr>
<th>Grade</th>
<th>Degree of breathlessness related to activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not troubled by breathlessness except on strenuous exercise</td>
</tr>
<tr>
<td>2</td>
<td>Short of breath when hurrying on the level or walking up a slight hill**</td>
</tr>
<tr>
<td>3</td>
<td>Walks slower than most people on the level, stops after a mile or so, or stops after 15 minutes walking at own pace</td>
</tr>
<tr>
<td>4</td>
<td>Stops for breath after walking about 100 yards or after a few minutes on level ground</td>
</tr>
<tr>
<td>5</td>
<td>Too breathless to leave the house, or breathless when undressing *</td>
</tr>
</tbody>
</table>

* General Exercise Advice

- **MRC Scale, British Lung Foundation, BTS Guideline 2013**
  - * Refer to Pulmonary Rehabilitation Unless Grade 5 and housebound (Grade A evidence)
  - ** Refer to Pulmonary Rehabilitation (Grade D evidence)
Pulmonary rehabilitation in COPD: NICE guidance CG101

**Pulmonary rehabilitation** (PR) should be offered to **all** patients who consider themselves functionally disabled by COPD (usually MRC grade 3 and above)

PR should be available to all appropriate people with COPD including those who have had a recent hospitalisation for an acute exacerbation [NICE CG101, 2010]

PR is not suitable for patients who are unable to walk, have unstable angina or who have had a recent myocardial infarction [NICE 2004]
## Benefits and evidence levels of pulmonary rehabilitation outcomes in COPD

Adapted via [Gloeckl et al](#).

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improves exercise capacity</td>
<td>A</td>
</tr>
<tr>
<td>Reduces the perceived intensity of breathlessness</td>
<td>A</td>
</tr>
<tr>
<td>Improves health-related quality of life</td>
<td>A</td>
</tr>
<tr>
<td>Reduces the number of hospitalisations and hospital days</td>
<td>A</td>
</tr>
<tr>
<td>Reduces anxiety and depression associated with COPD</td>
<td>A</td>
</tr>
<tr>
<td>Strength and endurance training of the upper limbs improves arm function</td>
<td>B</td>
</tr>
<tr>
<td>Benefits extend well beyond the immediate period of training</td>
<td>B</td>
</tr>
<tr>
<td>Improves survival</td>
<td>B</td>
</tr>
<tr>
<td>Respiratory muscle training can be beneficial, especially when combined with general exercise training</td>
<td>C</td>
</tr>
</tbody>
</table>

Category A: randomised controlled trials, rich body of data; Category B: randomised controlled trials, limited body of data; Category C: nonrandomised trials or observational studies.
Contraindications to exercise in COPD

Any of the 8 contraindications to exercise BAPCR, ACSM

Active COPD exacerbation or deterioration
Cautions to exercise in COPD

- Caution should be exercised or specialist advice considered if:
  - Resting SaO$_2$ <90%*
  - Diagnosis of pulmonary hypertension
- Oral corticosteroid use may cause muscle/tendon weakness and osteoporosis: advise care & monitoring

* but it is unclear if this threshold is of special significance BTS guidelines 2013
Exercise considerations in COPD: For clinicians

- Stratify patients according to need for medical support/surveillance
- Where appropriate, work closely with local pulmonary rehabilitation teams for support in tailoring exercise programmes to meet individual needs & abilities
- Encourage patients to discuss safe & effective daily exercise plans with their doctor or exercise specialist e.g. physiotherapist
- Reassure patients that mild breathlessness is a natural function of exertion
  - Use the 10-point Borg scale to rate perceived exertion (RPE) and exercise intensity
  - Aim for RPE of 4-6, or use other self-monitoring tools e.g. talk test

Roche et al. 2013, Cochrane Primary Care 2013
Cochrane Airways Group 2014, ACSM
Exercise considerations in COPD: For clinicians

- Ensure that patients warm up and cool down thoroughly
  - 10-15 minutes is critical
- Aerobic training should involve major muscle groups of the lower limbs
- To support activities of daily living, incorporate endurance and strength training for the upper limbs
- Strength training should include all major muscle groups
- Increase fitness levels gradually
- Consider interval training (short exercise intervals combined with regular rest periods, e.g. 30 secs exercise:30 secs rest) as an alternative to continuous training
  - May permit higher work intensities

Roche et al. 2013, Cochrane Primary Care 2013, Gloeckl et al Cochrane Airways Group 2014, ACSM, Beauchamp 2010
Exercise considerations in COPD: For Patients

• If breathless during exercise aim to slow down rather than stop
• If exercise induces persistent breathlessness that is more than mild to moderate
  – stop and rest
  – Take reliever inhaler and wait until feeling better before starting again
• Always notify an appropriate person if exercising in a group or gym
• Stop exercise if you experience nausea, lightheaded/dizziness, headache or pain in chest/neck/arm/jaw
• **Start rehabilitation early, maintain with physical activity = better prognosis!**

Vaes et al. 2014, Beauchamp 2010, ACSM
Exercise recommendations in COPD

- Aerobic exercise: 150 minutes/week
  - Light to moderate physical activity, e.g. walking, cycling, dancing, exercise classes

- Strength and balance exercises
  - At least twice a week
  - Individual prescription for resistance training, but aiming to complete 8-12 reps of each exercise, and at least 1 set

- Pulmonary rehabilitation
  - As appropriate

Patients may be advised to try pursed lip breathing or diaphragmatic breathing as advised via their pulmonary rehabilitation team or health care provider

Holland et al 2012, ACSM
Zainuldin et al 2011 Holland et al 2012 (2)
Video COPD

NHS video with patients talking about exercise and COPD
Gimeno-Santos E et al. Thorax doi:10.1136/thoraxjnl-2013-204763
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Learning summary

• Physical activity, specialist support and pulmonary rehabilitation are at the CORE of COPD management
  - Make every contact count!

• Physical inactivity negatively impacts the respiratory and disease processes in COPD

• Understanding the patient’s cycle of inactivity and how it can be broken is key to successful implementation of behaviour change
Further Resources

- WHO Global Initiative for COPD ([GOLD](#))
- British Thoracic Society [Guideline](#)
- British Lung Foundation [site](#)
- NHS Choices [site](#)
- ACSM [Current Comment](#)
- Canadian Thoracic Society [COPD Guidelines](#)
- Swedish Institute of Public Health [FYSS](#) chapter on COPD
References and links

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