Transcript for Prominence Obesity Implications on Cardiorespiratory Physiotherapy - Lecture

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Obesity implications in cardiorespiratory physiotherapy – a presentation developed by Dr Julie Broderick and Eilis Fitzgerald from the School of Public Health, Physiotherapy and Sports Science, University College Dublin in Ireland.

Slide 2:

Please note this is not an exhaustive presentation. This presentation aims to give an overview of the key considerations around obesity and cardiorespiratory physiotherapy.

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This presentation will be divided into two parts. Part one will focus on obesity and chronic respiratory disease. Part two will focus on obesity and the acute environment.

In part one, we'll explore the effects of obesity and respiration, obesity and asthma, and obesity and chronic obstructive pulmonary disease.

In part two, we will explore obesity and post-operative cardiorespiratory considerations, ventilation considerations, assessment considerations, and implication for physiotherapy treatment and practice.

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A glossary of terms we will use:

PwO refers to people living with obesity,

COPD refers to chronic obstructive pulmonary disease,

OSA refers to obstructive sleep apnoea,

FRC refers to functional residual capacity,

FEV1 refers to forced expiratory volume in 1 second,

TV refers to tidal volume,

CPAP refers to continuous positive airway pressure,

PEEP refers to positive end expiratory pressure,

ARDS refers to acute respiratory distress syndrome,

ICU refers to Intensive Care Unit.

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So, part one, obesity and chronic respiratory disease.

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Obesity is more common in people with chronic obstructive pulmonary disease than in the general population and is more prevalent in those with early-stage disease. Obesity can lead to reduced physical activity, increased sedentary behaviour, and worsening respiratory function and symptoms such as dyspnoea.

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The effect of obesity on respiration.

There are mechanical effects on breathing. Extra weight around the abdomen and chest can limit diaphragm movement and increase the work of breathing, thereby reducing tidal volume, functional residual capacity, and forced expiratory volume in one second.

The implication of weight gain is that it reduces pulmonary function longitudinally and lung volume changes happen, which increase the risk of developing atrial axes.

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There are inflammatory and metabolic effects due to an association with systemic inflammation, which may worsen COPD symptoms and contribute to disease progression. Obesity can reduce exercise tolerance and increase dyspnoea due to an increased oxygen demand and ventilatory load and musculoskeletal strain.

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The obesity paradox. The obesity paradox is the observation that in certain chronic diseases such, as COPD, living with obesity can

be protective in advanced disease. People living with obesity can show improved short to medium term outcomes in advanced COPD compared to those classified as underweight or normal weight.

Therefore, the relationship between obesity and chronic respiratory disease is nuanced.

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Proposed mechanisms for this paradox are BMI measurement issues which do not distinguish between fat and muscle, higher fat or muscle storage may buffer catabolic stress and offer energy reserves during illness.

Different inflammatory profiles, different cytokine and lipid profiles can modestly improve short-term survival.

Note, clinical guidelines still emphasise preventing and treating obesity while acknowledging aggressive weight loss in frail and chronically ill patients has the potential to be harmful.

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Obesity and asthma. Obesity is a known risk factor for asthma in adults. People living with obesity are more likely to develop asthma and experience more severe symptoms.

Obesity is associated with increased asthma severity and decreased response to pharmacological treatment. Possible mechanisms are increased systemic inflammation, altered immune responses, and mechanical effects on lung function due to excess body weight.

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There is evidence to support that weight loss improves asthma symptoms and lung function in PwO.

Weight-loss in older adults with asthma must address age-specific nutrition and include strength training to prevent functional decline and muscle loss.

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Obesity and obstructive sleep apnoea. OSA is characterised by repetitive episodes of airway obstruction during sleep, leading to disrupted sleep and various health issues.

Obesity is linked to the development of OSA.

Obesity significantly increases the risk of developing OSA, and raises the clinical suspicion of OSA and the need for formal sleep studies.

OSA can exacerbate existing comorbidities, including cardiovascular disease and metabolic syndrome.

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Proposed mechanisms are that fat deposits and decreased muscle activity in the upper respiratory tract can lead to airway narrowing.

This can lead to hypoxic and apnoeic episodes which can result in OSA.

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Assessment considerations. COPD GOLD guidelines (2025) recommend assessing BMI at all patient visits and monitor changes to this over time.

Many patients living with obesity will present with breathlessness.

Auscultation – breath sounds can sound diminished because they’re transmitted through a layer of adipose tissue.

Consider patient position during assessment - more upright positions have a positive effect on lung function in PwO.

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General physiotherapy treatment points. Generally, obesity is undertreated in people with chronic respiratory disease.

Tailor treatment plans to account for obesity.

Adjust exercise and rehabilitation programmes.

It is important to manage obesity related complications in PwO with respiratory disease, e.g., sleep apnoea or cardiovascular disease.

Consider referral to the multidisciplinary (MDT) members, such as psychologists and dieticians as required.

Continual reassessment and review of new obesity medications may change treatments, e.g., reduce need for continuous positive airway pressure (CPAP) in patients with OSA.

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Obesity as a 'treatable trait' in COPD. Obesity is an extrapulmonary 'treatable trait' in COPD, which is often overlooked. 'Treatable traits' approach involves assessing each patient for specific, modifiable problems and creating a personalised treatment plan based on this comprehensive evaluation.

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Targeting obesity via weight loss and resistance training in people with COPD can:

- reduce body weight,
- improve skeletal muscle strength & exercise tolerance,
- decrease depression, cardiovascular and metabolic risk markers,
- improve quality of life (HRQOL and Bode Index).

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Tailoring physiotherapy approach. Consider experience of stigma and discrimination, commonly experienced by people living with obesity, which can adversely affect their mental health and adherence to treatment.

Use a sensitive and non-judgemental approach when working with PwO.

Educate patients about the relationship between obesity and respiratory health.

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Part 2 - Obesity and the Acute Hospital Environment.

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Obesity and the surgical patient. There is a higher risk for surgical complications peri- and post-operatively for PwO.

PwO are also at a higher risk for postoperative pulmonary complications (PPCs). There are certain treatment implications due to this higher risk.

Provide pre-operative physiotherapy where possible. Prioritise patients post-operatively, and prioritise early mobilisation.

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Post-operative pulmonary complications (PPCs). PwO are at a higher risk for PPC's due to several factors.

Firstly, altered respiratory mechanics. There's reduced FRC, which leads to predisposing to atelectasis. There's increased work of breathing, there's diaphragmatic splinting, so abdominal contents press on diaphragm, and there's also reduced lung volumes.

Comorbidities:

There's an increased risk of OSA in this cohort, which increases the risk of upper airway obstruction and hypercapnic respiratory failure post-extubation.

There are also gas exchange abnormalities, so therefore there's a predisposition to atelectasis can lead to shunting and hypoxia.

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Obesity and the Intensive Care Unit (ICU) environment. PwO account for up to 20% of ICU admissions worldwide.

Obesity drives multimorbidity through disruption of hormonal balances and metabolic dysfunction, increasing risk for obesity-related complications across multiple systems, e.g., type 2 diabetes (T2DM), hypertension, cardiovascular disease (CVD), chronic kidney disease (CKD), OSA, non-alcoholic fatty liver disease, osteoarthritis, and certain cancers.

There is a higher morbidity associated with PwO in the ICU environment.

Evidence demonstrates a relationship between obesity and lower short- and long-term mortality rates in critical care when compared to critical care patients with a normal BMI.

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Treating PwO in the ICU environment. Knowledge of obesity-related differences in respiratory anatomy and physiology is necessary to optimise respiratory management strategies

PwO with a background of COPD are more likely to need non-invasive or mechanical ventilation, tracheostomy insertion, and are more likely to be discharged on home oxygen

When mechanical ventilation is required, it is necessary to take into account obesity-related physiological changes in pulmonary function.

Prone position can be used effectively for PwO particularly with ARDS.

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Positioning considerations. Positioning is an important factor in both assessment and treatment when working with PwO. Evidence to support positioning has an effect on pulmonary function with supine positions associated with reduced pulmonary function.

"Good lung down rule'" is not considered effective for PwO. Consider seated/upright positions, if feasible.

Reverse Trendelenburg position has been shown to improve respiratory parameters in critically ill PwO when compared with semi-recumbent positions.

Optimal positioning has a role in ensuring optimal ventilation for PwO requiring mechanical ventilation.

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Ventilation considerations for PwO. Invasive ventilation is indicated for PwO in acute respiratory failure if non-invasive ventilation fails or is contraindicated. For PwO, intubation is considered high risk due to factors such as macroglossia, soft tissue thickening, and having a shorter neck.

Optimising ventilation settings for PwO can be challenging due to decreased lung compliance, increased airway resistance, and reduced FRC.

Target tidal volume should be set according to ideal body weight rather than actual body weight. Arterial blood gases and airway pressure should be factored when adjusting tidal volumes.

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Setting higher lung volumes than based on the ideal body weight does not improve gas exchange, and increases risk for ventilator-associated lung injury.

PwO often require longer periods of invasive ventilation. This may result from increased work of breathing caused by altered respiratory mechanics, ventilatory drive, and neuromuscular strength.

Reduction in sedation while invasively ventilated may positively affect ventilation time.

Early tracheostomy insertion when indicated may reduce ICU length of stay and ventilation duration, however the procedure is more technically challenging due to altered anatomy in PwO.

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Extubating PwO can be challenging due to several factors:

- reduced FRC leads to depletion of oxygen stores,

- predisposition to atelectasis,

- pre-existing obesity related complications, e.g., obesity hypoventilation syndrome,

Extubation considerations:

- an increased risk for re-intubation due to high prevalence of OSA, and

- an increased risk for post-extubation stridor.

Slides 29 - 32:

Please note these are references associated with this presentation.

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Thank you for listening. If you wish to get in touch in relation to this presentation, my contact details are here. Thank you.