

Gait characteristics of patients with COPD

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Valorisation



This thesis includes a series of scientific studies to broaden our knowledge on gait characteristics of patients with chronic obstructive pulmonary disease (COPD). In the current chapter, these studies and their outcomes are positioned in a broader societal and economical context to transfer the scientific knowledge described into clinical practice, and to translate the findings into future perspectives.

Relevance

COPD is highly prevalent and is expected to further increase in the coming decades. COPD is a leading cause of morbidity and mortality worldwide. Moreover, COPD has a major societal and economic burden, due to factors such as frequent exacerbations and the presence of comorbidities in patients with COPD. COPD has a significantly impact on a patient's quality of life and those caring for the patient. In addition, the decline in respiratory function characterizes COPD and is associated with progressive symptoms and functional impairment.

Patients with COPD suffer from skeletal muscle dysfunction and functional limitations, which have a significant effect on the patients' daily life. Skeletal muscle dysfunction and functional limitations worsen with increasing disease severity. Functional limitations result in reduced independence and quality of life in patients with COPD. Consequently, activities of daily life, such as walking, become increasingly more difficult to perform. Furthermore, patients with COPD are at increased risk for falls as compared to non-COPD individuals. As falls often occur during walking, it is important to gain a better understanding of gait impairments in COPD. Consequently, improved insight into gait impairments in COPD can contribute to developing assessment tools to evaluate gait function and providing interventions to reduce gait impairments in patients with COPD.

Target groups

Health care professionals

The results of this thesis are primarily important for health care providers, such as respiratory physicians and physiotherapists. Increasingly more studies report gait alterations in patients with COPD as compared to non-COPD individuals and the current findings presented in this thesis strengthen previous findings on gait alterations in COPD. While gait assessment is currently not incorporated in clinical practice for COPD, it may be a promising tool to improve patient's care. Therefore, this thesis contributes to the in-

creasing awareness of the extra-pulmonary manifestations of COPD, including reduced mobility and gait function. It discusses the opportunities of gait analysis and its clinical implications in the respiratory field. Identifying gait impairments in patients with COPD is important to determine appropriate diagnostic tools to assess gait function in this population. In addition, gait characteristics that are associated with fall risk are of clinical interest and gait analysis in COPD may help deciding treatment methods for those with impaired gait function. Consequently, gait assessment and gait training may become an essential part of disease management in COPD.

Patients with COPD

Patients do not directly benefit from the studies described in this thesis. However, this thesis sheds light on gait assessment and evaluation of gait function after pulmonary rehabilitation in COPD. On the long term, patients may profit from a better understanding of gait impairments in COPD. Diagnostic tools for gait impairments may be developed and training programs directed to improve gait function in COPD may be introduced in the treatment of patients. Such gait training exercises could be integrated in pulmonary rehabilitation programs to provide personalized care to each patient.

This thesis showed that patients with COPD benefit from a comprehensive pulmonary rehabilitation program. More specifically, lower-limb muscle strength and endurance, body composition, mobility, functional exercise capacity and walking speed improve following pulmonary rehabilitation. These findings are in line with the current literature on the benefits of pulmonary rehabilitation for patients with COPD.

Activities and products

The findings of this thesis have led to several activities in the field of expertise. The results of this thesis have been presented at various symposia and congresses, including the European Respiratory Society Congress in 2014 (Munich, Germany), 2015 (Amsterdam, the Netherlands), and 2016 (London, United Kingdom); the SMALLL congress in 2015 (Maastricht, the Netherlands) and 2017 (Leuven, Belgium); the World Congress of Biomechanics in 2018 (Dublin, Ireland); and the Netherlands Respiratory Society Symposium in 2015. Furthermore, the findings have been translated into original manuscripts, published in international scientific journals. Results have been presented at different meetings at CIRO, Maastricht University, Maastricht University Medical Centre and other institutions. These activities have led to a pilot study aimed at gait perturbation in patients with COPD. To gain expertise from a renowned center in gait variability, this has led

to an international collaboration to study the underlying patterns within gait fluctuations in COPD, at the Center for Research in Human Movement Variability at the University of Nebraska in Omaha (US). This thesis may inspire future research in understanding gait characteristics in patients with COPD and determining methods to evaluate and improve gait function in COPD.

Future perspectives

The findings in the current thesis might be important for researchers in the field. This thesis described alterations in gait characteristics of patients with COPD. This has led to new research questions, which are presented in the discussion chapter. The presented findings create new opportunities and calls for future studies. Studies into gait impairments in COPD in various conditions are needed, and investigations in the underlying causes of gait impairments and its relation to balance and fall risk in COPD are recommended. Furthermore, studies into methods (e.g. exercise, gait or balance training) to improve gait characteristics in patients with COPD is of interest to improve gait function in these patients.

In addition, gait analysis was conducted using three dimensional motion capture systems, the gold standard for gait assessment. In the near future, studies may investigate the use of portable and less expensive systems to quantify and monitor gait characteristics in COPD. This creates the opportunity to evaluate and monitor gait in patients with COPD in their home environment. In turn, gait assessment may become more accessible in clinical practice, enabling implementation of gait assessment in standard care for COPD.