

obstructive pulmonary disease. 2019 Report. Available at: <https://goldcopd.org/wp-content/uploads/2018/11/GOLD-2019-v1.6-FINAL-08Nov2018-wms.pdf>.

6. Matsui H, Jo T, Fushimi K, Yasunaga H. Outcomes after early and delayed rehabilitation for exacerbation of chronic obstructive pulmonary disease: a nationwide retrospective cohort study in Japan. *Respir Res.* 2017;18:68.

Afroditi K. Boutou¹, Theodoros Kontakiotis²

¹ Department of Respiratory Medicine, G. Papanikolaou Hospital, Thessaloniki, Greece Exohi, 57010 Thessaloniki, Greece

² Department of Respiratory Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece
E-mail address: afboutou@yahoo.com (A.K. Boutou).

19 June 2019

Available online 25 September 2019

<https://doi.org/10.1016/j.pulmoe.2019.07.005>
2531-0437/

© 2019 Sociedade Portuguesa de Pneumologia. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Effects of a community-based pulmonary rehabilitation programme during acute exacerbations of chronic obstructive pulmonary disease - A quasi-experimental pilot study. Authors' reply



We are grateful to Dr. Boutou¹ for her reassuring letter about our manuscript entitled "Effects of a community-based pulmonary rehabilitation programme during acute exacerbations of chronic obstructive pulmonary disease - A quasi-experimental pilot study."² The most appropriate time point to begin pulmonary rehabilitation during an acute exacerbation of chronic obstructive pulmonary disease (AECOPD) and who can benefit the most from this comprehensive intervention is indeed a similar "Holy Grail" on how to maintain the benefits after pulmonary rehabilitation.³ It is worth noting that in the latest Cochrane review of Puhan and co-workers,⁴ from the 20 studies included, 13 were conducted with inpatients,⁵⁻¹⁷ although 80% of the AECOPD are managed on an outpatient basis,¹⁸ when patients are integrated in the community. This relative lack of research exploring the benefits of pulmonary rehabilitation when patients are integrated into their daily routines and environment and supported by their loved ones, might be "blurring" our understanding of the role of pulmonary rehabilitation considering the whole picture of the AECOPD. Our pilot study contributed to clarify this role, by showing that pulmonary rehabilitation is a safe, feasible and effective intervention for these patients, however, more studies following robust methodologies are urgently needed.

Another important aspect that might contribute to misunderstanding the role of pulmonary rehabilitation during AECOPD is the healthcare context of each country. For example, in the letter of Dr. Boutou¹ her understanding was that because our patients were identified by pulmonologists at the hospital, patients would be suffering from severe or moderate-to-severe exacerbations. Yet, in our healthcare system, when an AECOPD occurs most patients go to the hospital to be assessed by a doctor and have their medication adjusted, and it does not necessarily mean that they are having a severe exacerbation. In fact, a wide variety in the severity of exacerbations will come up on a daily

basis at the hospital, hence different medication usage. Most cases are sent to be managed on an outpatient basis and it was those patients that were recruited for our study. Although it is unlikely that different responses would have been obtained about the pulmonary rehabilitation based on different medication usage, which would have meant stratifying patients per exacerbation severity, it is important that future studies explain in a more detailed manner the healthcare context where recruitment occurs to avoid misinterpretations of the clinical profile of patients included in the studies.

We agree with Dr. Boutou¹ that timing is key to determining the success of an intervention. In our study, participants' first assessment was performed within 48 h of the diagnosis of AECOPD and the intervention started within 72 h. Our results further add to those of Matsui and colleagues showing that, for patients treated in the community, early interventions may result in improvements in muscle strength, impact of the disease and symptoms.¹⁹

In fact, in our study, an analysis per severity of airflow obstruction was not performed. Although lung function is an essential component of the diagnostic of COPD, no significant relationship between lung function and response to pulmonary rehabilitation has been found in patients with stable COPD.²⁰ Moreover, not all severely obstructed patients are highly symptomatic and limited in their daily living and some of those with mild obstruction are also known to experience high symptom burden and activities limitation.^{21,22} It is therefore, unlikely that based on the restriction of the airflow obstruction differential responses would have been obtained.²²

In conclusion, community-based pulmonary rehabilitation seems to benefit patients with AECOPD but further research on the multidimensional assessment of patients, identification of who can most benefit, time of initiation and best regimen following a person-centred approach²² are areas that need future rigorous research.

Acknowledgements

This work was funded by Programa Operacional de Competitividade e Internacionalização - PO CI, through Fundo Europeu de Desenvolvimento Regional - FEDER (POCI-01-0145-FEDER-007628; PO CI-01-0145-FEDER-028806), Fundação para a Ciência e Tecnologia (PTDC/DTP-

PIC/2284/2014; PTDC/SAU-SER/28806/2017) and under the project UID/BIM/04501/2019).

References

- Boutou AK, Kontakiotis T. Community-based pulmonary rehabilitation during acute exacerbation of chronic obstructive pulmonary disease: Pilling up the evidence; 2019, <http://dx.doi.org/10.1016/j.pulmoe.2019.07.005>.
- Machado A, Oliveira A, Valente C, Burtin C, Marques A. Effects of a community-based pulmonary rehabilitation programme during acute exacerbations of chronic obstructive pulmonary disease - A quasi-experimental pilot study. *Pulmonology*. 2019, <http://dx.doi.org/10.1016/j.pulmoe.2019.05.004>.
- Rochester CL, Spruit MA. Maintaining the Benefits of Pulmonary Rehabilitation. *The Holy Grail*. *Am J Resp Crit Care*. 2017;195:548–51.
- Puhan MA, Gimeno-Santos E, Cates CJ, Troosters T. Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database Syst Rev*. 2016;12:Cd005305.
- Kirsten DK, Taube C, Lehnigk B, Jorres RA, Magnussen H. Exercise training improves recovery in patients with COPD after an acute exacerbation. *Respir Med*. 1998;92:1191–8.
- Nava S. Rehabilitation of patients admitted to a respiratory intensive care unit. *Arch Phys Med Rehab*. 1998;79:849–54.
- Behnke M, Jorres RA, Kirsten D, Magnussen H. Clinical benefits of a combined hospital and home-based exercise programme over 18 months in patients with severe COPD. *Monaldi Arch Chest Dis*. 2003;59:44–51.
- Carr SJ, Hill K, Brooks D, Goldstein RS. Pulmonary rehabilitation after acute exacerbation of chronic obstructive pulmonary disease in patients who previously completed a pulmonary rehabilitation program. *J Cardiopul Rehabil*. 2009;29:318–24.
- Eaton T, Young P, Fergusson W, Moodie L, Zeng I, O’Kane F, et al. Does early pulmonary rehabilitation reduce acute health-care utilization in COPD patients admitted with an exacerbation? A randomized controlled study. *Respirology*. 2009;14:230–8.
- Troosters T, Probst VS, Crul T, Pitta F, Gayan-Ramirez G, Decramer M, et al. Resistance training prevents deterioration in quadriceps muscle function during acute exacerbations of chronic obstructive pulmonary disease. *Am J Resp Crit Care*. 2010;181:1072–7.
- Tang CY, Blackstock FC, Clarence M, Taylor NF. Early rehabilitation exercise program for inpatients during an acute exacerbation of chronic obstructive pulmonary disease: a randomized controlled trial. *J Cardiopul Rehabil*. 2012;32:163–9.
- Borges RC, Carvalho CR. Impact of resistance training in chronic obstructive pulmonary disease patients during periods of acute exacerbation. *Arch Phys Med Rehab*. 2014;95:1638–45.
- Greening NJ, Williams JE, Hussain SF, Harvey-Dunstan TC, Bankart MJ, Chaplin EJ, et al. An early rehabilitation intervention to enhance recovery during hospital admission for an exacerbation of chronic respiratory disease: randomised controlled trial. *BMJ*. 2014;349:g4315.
- Torres-Sánchez I, Valenza MC, Valenza-Demet G, Cabrera-Martos I, Flores-Barba MJ, Ruíz-Sáez A. Quality of life in hospitalized patients for exacerbation of COPD included in a physical therapy program. *Chest*. 2014;145:372A (3 MeetingAbstracts).
- He M, Yu S, Wang L, Lv H, Qiu Z. Efficiency and safety of pulmonary rehabilitation in acute exacerbation of chronic obstructive pulmonary disease. *Med Sci Monit*. 2015;21:806–12.
- Liao LY, Chen KM, Chung WS, Chien JY. Efficacy of a respiratory rehabilitation exercise training package in hospitalized elderly patients with acute exacerbation of COPD: a randomized control trial. *Int J Chron Obstruct Pulmon Dis*. 2015;10:1703–9.
- Torres-Sanchez I, Valenza MC, Saez-Roca G, Cabrera-Martos I, Lopez-Torres I, Rodriguez-Torres J. Results of a Multimodal Program During Hospitalization in Obese COPD Exacerbated Patients. *COPD*. 2016;13:19–25.
- GOLD. Global Strategy for Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease 2019 report. In: *The Global Initiative for Chronic Obstructive Lung Disease*; 2019. p. 1–155.
- Matsui H, Jo T, Fushimi K, Yasunaga H. Outcomes after early and delayed rehabilitation for exacerbation of chronic obstructive pulmonary disease: a nationwide retrospective cohort study in Japan. *Respir Res*. 2017;18:68.
- Augustin IML, Wouters EFM, Houben-Wilke S, Gaffron S, Janssen DJA, Franssen FME, et al. Comprehensive Lung Function Assessment Does not Allow to Infer Response to Pulmonary Rehabilitation in Patients with COPD. *J Clin Med*. 2018;8.
- Annegarn J, Meijer K, Passos VL, Stute K, Wiechert J, Savelberg HH, et al. Problematic activities of daily life are weakly associated with clinical characteristics in COPD. *J Am Med Dir Assoc*. 2012;13:284–90.
- Spruit MA, Augustin IM, Vanfleteren LE, Janssen DJ, Gaffron S, Pennings HJ, et al. Differential response to pulmonary rehabilitation in COPD: multidimensional profiling. *Eur Respir J*. 2015;46:1625–35.

Ana Machado^{a,b}, Ana Oliveira^{a,b}, Carla Valente^c,
Chris Burtin^{d,e}, Alda Marques^{a,b,*}

^a Lab 3R – Respiratory Research and Rehabilitation Laboratory, School of Health Sciences, University of Aveiro, Aveiro, Portugal

^b Institute of Biomedicine (iBiMED), University of Aveiro, Aveiro, Portugal

^c Pulmonology Department, Centro Hospitalar do Baixo Vouga, Aveiro, Portugal

^d REVAL – Rehabilitation Research Center, Faculty of Rehabilitation Sciences, Hasselt University, Diepenbeek, Belgium

^e BIOMED – Biomedical Research Institute, Hasselt University, Hasselt, Belgium

*Corresponding author at: Lab 3R – Respiratory Research and Rehabilitation Laboratory, School of Health Sciences and Institute of Biomedicine (iBiMED), University of Aveiro (ESSUA), Agras do Crasto - Campus Universitário de Santiago, Edifício 30, 3810-193 Aveiro, Portugal.

E-mail addresses: filipamachado@ua.pt (A. Machado), alao@ua.pt (A. Oliveira), carlavalente77@hotmail.com (C. Valente), chris.burtin@uhasselt.be (C. Burtin), amarques@ua.pt (A. Marques).

30 August 2019

<https://doi.org/10.1016/j.pulmoe.2019.09.001>
2531-0437/

© 2019 Sociedade Portuguesa de Pneumologia. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).