Effects of Home-based Pulmonary Rehabilitation on the Symptoms of People With Exacerbations of COPD: A Mixed-methods Randomized Controlled Trial

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Rationale: Exacerbations of chronic obstructive pulmonary disease (ECOPD) have a negative impact on individuals' symptoms and disease progression. Pulmonary rehabilitation (PR) is a well-established intervention for the management of people with stable disease, however uncertainty exists about the safety and beneficial effects of delivering PR during ECOPD, particularly in those who do not require hospital admission. We explored the safety, effects and self-reported impact of a home-based PR program on the symptoms of people with ECOPD managed in an outpatient basis. Methods: A mixed-methods randomized controlled trial was conducted (NCT03751670) in people diagnosed with ECOPD who did not require hospital admission. People with ECOPD were randomly assigned to the control (CG, i.e., standard medication) or experimental (EG, i.e., standard medication and 3-weeks of supervised home-based PR) group within 48h of the diagnosis (baseline). The PR program (2 times/week) was composed of exercise training, breathing control exercises, airway clearance techniques and psychoeducational support. Symptoms and their impact on individuals' daily life were assessed at baseline and after 3 weeks (post) with the COPD assessment test (CAT), the modified Medical Research Council dyspnea guestionnaire (mMRC), the cough and sputum assessment questionnaire (CASA-Q), the checklist individual strength-fatigue (CIS-8) and the London chest activity of daily living scale (LCADL). After PR, interviews were conducted. Analyses were performed using (non-)parametric mixed ANOVAs, deductive thematic analysis and narrative integration through joint displays. Results: Fifty participants with ECOPD managed in an outpatient basis (78% male, 70±11 years, FEV₁ 47±16% predicted) were included. A significantly greater improvement in the EG compared to the CG was found in all outcome measures except in the CASA-Q sputum scores (Table 1). At post assessment, the EG presented significant improvements in all outcome measures, while the CG only improved in the CAT and CASA-Q (p<0.05). A positive self-perceived impact of PR on symptoms was found (Table 1 - Supporting Quote). No adverse events were reported. Conclusions: A 3-weeks home-based PR program is safe, meaningful and 2-4 times more effective than only standard medication in improving the symptoms of people with ECOPD managed in an outpatient basis. Our findings highlight the role of PR in improving the recovery process during ECOPD. Given the known relation between symptoms and disease prognosis, PR might also possibly contribute to a better prognosis in these individuals.

	Control group (n=26)		Experimental group (n=24)		Group*Time	
	Baseline	Post	Baseline	Post	interaction	Supporting Quote (Experimental group)
CAT, total score	23.2 ± 7.1	17.4 ± 9.5*	23.1 ± 7.1	10.6 ± 5.4*	0.002	Oh I really feel that my quality of life improved! () Everything. I feel really good! I feel, I feel really good. (Dan)
mMRC, grade	2 [2; 3]	2 [1; 3]	3 [2; 3]	2 [1; 2]*	0.006	It improved, of course it got better! I almost didn't breathel I felt like there was something that would barely let me breathe. Just to go to there to the market I barely could do it. (Ethan)
CASA-Q, score Cough symptoms Cough impact Sputum symptoms Sputum impact	54.2 [25; 66.7] 42.2 [28.1; 81.3] 29.2 [16.7; 66.7] 43.8 [29.2; 75]	83.3 [50; 91.7]* 85.9 [59.4; 100]* 75 [41.7; 100]* 95.8 [66.7; 100]*	37.5 [12.5; 58.3] 42.2 [26.6; 65.6] 29.2 [8.3; 58.3] 52.1 [37.5; 81.3]	91.7 [83.3; 100]* 100 [82.8; 100]* 79.2 [70.8; 100]* 100 [87.5; 100]*	0.006 0.047 0.081 0.948	I feel that my lungs are clean, I go to bed and I don't have problems. Now I don't have cough nor anything when I go to sleep. () My symptoms are relieved. (Ethan)
CIS-8, total score	46 [38; 52]	41.5 [27; 50]	44.5 [39; 50.5]	31.5 [25.5; 35.5]*	0.003	At the beginning of my respiratory crisis I felt really tired. But with this treatment it improved, it improved a lot the tiredness that I use to feel. () (Paul)
LCADL, % score	39.3 [31.4; 56]	36.4 [28; 58.7]	45.2 [35.9; 57,3]	34.3 [25.2; 45.3]*	0.001	Before, sometimes I wanted to walk or go with my wife and carry some groceries from the supermarket and I couldn't. But now, now I can do that and even more. () Now I have strength and I can walk and everything. (Peter)

Table 1 – Effects of a 3-weeks home-based pulmonary rehabilitation program during exacerbations of chronic obstructive pulmonary disease (n=50). Joint display presenting the integration of quantitative and qualitative data.

Data are presented as mean±standard deviation or median [1st quartile; 3rd quartile]. Bold denotes a significant group*time interaction. *Significant time effect (baseline vs. post). All the names mentioned are pseudonyms. CASA-Q, cough and sputum assessment questionnaire; CAT, COPD assessment test; CIS-8, checklist individual strength 8-itens questionnaire; LCADL, London chest activity of daily living scale; mMRC, modified Medical Research Council dyspnea questionnaire.

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