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Burden of COPD in patients treated in different care settings in the Netherlands

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ABSTRACT

Introduction: Care for patients with chronic obstructive pulmonary disease (COPD) can be provided in primary, secondary or tertiary care. Whether and to what extent patients with COPD treated in various healthcare settings differ in disease burden and healthcare utilization remains unknown. Therefore, daily symptoms, functional mobility, mood status, health status and healthcare utilization were compared between COPD patients in various care settings, to explore possibilities for healthcare-optimization.
Methods: Current data are part of the Chance study. Demographics, functional mobility (Care Dependency Scale (CDS); Timed-Up-and-Go (TUG) test), mood status (Hospital Anxiety and Depression scale (HADS)), health status (COPD Assessment test (CAT); Clinical COPD questionnaire (CCQ); COPD specific St. George Respiratory questionnaire (SGRQ-C)), received treatments and severity of physical and psychological symptoms were assessed in subjects with and without COPD.
Results: 836 subjects (100 primary care patients, 100 secondary care patients, 518 tertiary care patients and 118 non-COPD subjects) were included. The burden of disease significantly increased from primary care to tertiary care. However, in all three healthcare settings a high percentage of patients with an impaired health status was observed (i.e. CAT $\geq$10 points, 68.0% vs. 91.0% vs. 94.5%, respectively). Furthermore, many patients treated in secondary care remain highly symptomatic despite treatment, while others with low burden of disease would allow for de-intensification of care.
Conclusion: This study revealed important shortcomings and challenges for the care of COPD patients in the Netherlands. It emphasizes the need for detailed patient characterization and more individualized treatment, independent of the healthcare setting.

1. Introduction

Chronic obstructive pulmonary disease (COPD) is one of the most prevalent non-communicable diseases worldwide, associated with substantial morbidity and mortality [1]. Population-based studies estimated that about 10% of the adult population has at least a moderate degree of chronic airflow limitation [2]. Healthcare for patients with COPD varies between jurisdictions, mostly due to local policies and conditions [3–5]. In most jurisdictions, however, patients with COPD can receive primary care, secondary care and/or tertiary care [6]. While the majority of patients with established COPD is treated in primary care [7], most of the current understanding of the heterogeneous pulmonary and systemic features of COPD and the burden of disease is based on cohorts of patients recruited in secondary and/or tertiary care [8]. Also the degree of overlap as potential differences in real-life burden of disease and healthcare utilization between care settings is mostly unexplored. Vest and colleagues found no differences in demographics and smoking history between primary and secondary care patients [9]. Additionally, Herland and colleagues reported no differences in amount of comorbidities between primary and secondary care patients [10]. In contrast, Kruis and colleagues showed that COPD patients participating in large pharmaceutically-sponsored studies differed substantially in lung function, health status and

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exacerbation frequency from primary care patients [11]. More studies comparing relevant patient-related outcomes of patients with COPD in different healthcare settings are lacking. Thus, external validity of previously performed COPD studies conducted in secondary and/or tertiary care is mostly unknown [11], as is the true burden of disease in primary care. Although differences in the degree of chronic airflow limitation may partially account for differences between care settings, it is well recognized that lung function is a poor predictor of patient-related outcomes in COPD [12,13].

A better understanding of the clinical characteristics and healthcare consumption of patients with COPD treated in various care settings will help clinicians and healthcare policy makers in the development of tools for integrated assessment of burden of disease, decision taking regarding intensity of monitoring of patients, and allocation of patients.

The aim of the present study was to compare burden of disease and healthcare utilization between patients with COPD treated in primary care, secondary care or tertiary care and explore possibilities for optimization of care. *A priori*, we hypothesized that there is substantial overlap in daily symptoms, functional mobility, mood status, health status and healthcare utilization between patients in primary, secondary and tertiary care setting, but that patients in tertiary care have the highest disease burden.

2. Methods

The current data are part of the Chance study, an observational longitudinal study concerning the clinical, physiological and psychosocial determinants of health status in a broad sample of patients with COPD and non-COPD controls [14]. The Medical Ethical Committee of the Maastricht University Medical Centre (Maastricht, The Netherlands) approved the study (METC 11-3-070), which is registered at the Netherlands National Trial Register (NTR 3416).

2.1. Study sample

Patients with COPD (defined as post-bronchodilator forced expiratory volume in the first second (FEV_1)/forced vital capacity (FVC) < 0.7) were recruited at eight general practices (GPs, primary care) in the Southern part of the Netherlands, at the outpatient pulmonary clinic of the Maastricht University Medical Centre, the Netherlands (secondary care) and at the highly-specialized pulmonary rehabilitation center CIRO in Horn, the Netherlands (tertiary care). Primary care COPD patients were recruited from the Registration Network of Family Practices (RNH), initiated by Maastricht University [15]. Patients were eligible for participation if they received COPD treatment from a GP only. Consecutive patients visiting the secondary care setting were eligible if they had their regular check-ups with a chest physician in the hospital, optionally in combination with treatment by a GP. Patients derived from RNH, who were both being treated by a GP and a chest physician, were also considered eligible for inclusion in the secondary care group. Tertiary care patients were recruited and assessed during a pre-rehabilitation assessment in CIRO, after referral by a chest physician. Non-COPD subjects were recruited at the same GPs as the primary care COPD patients. They were eligible if they had no history of respiratory diseases, heart failure, malignancies within the past 5 years or other clinically relevant disease which may influence health status according to the principal investigator. Non-COPD subjects, primary care and secondary care patients were assessed during a single home visit. All patients gave written informed consent. Details about other in- and exclusion criteria, recruitment and assessment have been described in the study protocol [14].

2.2. Measurements

Demographics, general characteristics, smoking history, degree of dyspnea (modified Medical Research Council, mMRC) [16], resting oxygen saturation, body mass index (BMI), body composition (bioelectrical impedance assessment, BIA; fat-free mass index, FFMI) [17], comorbidities (Charlson Comorbidity Index, CCI) [18], frequency of exacerbations and hospitalizations twelve months prior to inclusion and medical history and medications were assessed. Post-bronchodilator spirometry (FEV_1 and FVC) in primary care patients, secondary care patients and non-COPD subjects was performed with a handheld SpiroPro (Jaeger/Cardinal Health, Hoechberg, Germany) in the home setting. Lung function in tertiary care patients was assessed with standardized spirometry equipment of Masterlab (CareFusion, Hoechberg, Germany) [19]. Patients with COPD were divided into the four updated GOLD groups; based on the degree of airflow limitation and number of exacerbations in the past 12 months (A/B vs. C/D) and the severity of symptoms, based on CAT score (A/C *vs.* B/D) [20]. Burden of disease was determined according to the amount and severity of daily symptoms, functional mobility, mood status and health status. Functional mobility was assessed with the Care Dependency Scale (CDS) [21] and Timed Up-and-Go (TUG) test [22]. Mood status was measured with the Hospital Anxiety and Depression Scale (HADS) [23]. Disease-specific health status was assessed using the COPD Assessment Test (CAT) [24], the Clinical COPD Questionnaire (CCQ) [25] and the COPD-specific version of the St George's Respiratory Questionnaire (SGRQ-C) [26]. Additionally, a questionnaire concerning the type and amount of received care and a questionnaire about the degree of physical and psychological self-perceived symptoms were assessed [14,27].

2.3. Statistics

The sample size calculation has previously been described in the published protocol [14]. Results are presented as mean and standard deviation (SD), median and interquartile range (IQR), and/or proportions, as appropriate. Categorical variables were described as absolute numbers and frequencies.

To gain insight in the burden of disease, internationally accepted cut-offs for high symptoms or abnormal values were applied: mMRC score ≥ 2, CAT ≥ 10, CCQ > 1, SGRQ > 25 [20], HADS ≥ 10 [23], BMI < 18.5 or ≥ 25 kg/m^2 [28] and FFMI $< 5\%$ percentile [29].

All variables were tested for normality with the Kolmogorov-Smirnov test. Normally distributed variables were assessed by a one-way analysis of variances (ANOVA). When appropriate, post hoc least significance difference (LSD) multiple comparisons were performed. Not-normally distributed variables were assessed with a Kruskal-Wallis test. A Chi-square test was applied for categorical variables. All statistics were done using SPSS V.20.0. A p-value equal to or less than 0.01 was considered statistically significant.

3. Results

In total, 836 subjects (55.9% male, mean age 64.4 (±8.6) years) were included, of which 100 primary care COPD patients, 100 secondary care COPD patients, 518 tertiary care COPD patients and 118 non-COPD subjects. Patient characteristics, daily symptoms, functional mobility, mood status and health status of these four groups are presented in Table 1.

3.1. COPD versus non-COPD

Patients with COPD had significantly more pack years, a worse lung function and more comorbidities than non-COPD subjects.