



Review Article

Chronic Obstructive Pulmonary Disease in the elderly[☆]Raffaele Antonelli Incalzi^{a,b,*}, Simone Scarlata^a, Giorgio Pennazza^c, Marco Santonico^c, Claudio Pedone^a^a Geriatrics, Unit of Respiratory Pathophysiology, Campus Bio-Medico University and Teaching Hospital, Rome, Italy^b San Raffaele – Cittadella della Carità Foundation, Taranto, Italy^c Center for Integrated Research – CIR, Unit of Electronics for Sensor Systems, Campus Bio-Medico University, Rome, Italy

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ABSTRACT

The prevalence of Chronic Obstructive Pulmonary Disease (COPD) dramatically increases with age, and COPD complicated by chronic respiratory failure may be considered a geriatric condition. Unfortunately, most cases remain undiagnosed because of atypical clinical presentation and difficulty with current respiratory function diagnostic standards. Accordingly, the disease is under-recognized and undertreated. This is expected to impact noticeably the health status of unrecognized COPD patients because a timely therapy could mitigate the distinctive and important effects of COPD on the health status. Comorbidity also plays a pivotal role in conditioning both the health status and the therapy of COPD besides having major prognostic implication. Several problems affect the overall quality of the therapy for the elderly with COPD, and current guidelines as well as results from pharmacological trials only to some extent apply to this patient. Finally, physicians of different specialties care for the elderly COPD patient: physician's specialty largely determines the kind of approach. In conclusion, COPD, in itself a complex disease, becomes difficult to identify and to manage in the elderly. Interdisciplinary efforts are desirable to provide the practicing physician with a multidisciplinary guide to the identification and treatment of COPD.

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1. Clinical vignette

An 81-year-old male with a clinical presumptive diagnosis of Chronic Obstructive Pulmonary Disease (COPD) and several comorbidities (hypertension, chronic stable angina, peripheral artery disease, chronic renal failure, severe osteoporosis and diabetes mellitus (DM), Parkinson's disease) presented to the Emergency Department (ED) with progressively worsening confusion and hypersomnolence. Despite the high risk of COPD, due to the presence of chronic productive cough, wheezing and exertional dyspnea, as well as the smoking history (22 packs/year), he had never been definitively diagnosed as affected by COPD because he could not perform an acceptable flow-volume curve maneuver. At admission, he complained of mild chest pain and orthopnea in the last three days. Prior to this acute event, the patient was partially autonomous in basic and instrumental activities of daily living, was able to walk without aids and showed no overt cognitive impairment (Mini-Mental State Examination, MMSE score obtained 6 months earlier: 24/30). However, according to his caregivers, he was poorly compliant to inhalers due to coordination limitation related to his extra-pyramidal rigidity. In the past 4 months, he had been hospitalized twice for worsening dyspnea and/or expectoration, and he

had experienced a weight loss of about 6 kg. He received annual flu-vaccine and *Streptococcus pneumoniae* vaccination. His therapy included: inhaled triple therapy (long acting B₂-agonists, anticholinergics and corticosteroids), cardio-selective B-blockers, ACE-inhibitors, acetylsalicylic acid, metformin, glibenclamide, diphosphonates and D-vitamin integration. Vital signs on arrival to the ED were: blood pressure 110/65 mm Hg, heart rate 120 bpm and respiratory rate 28 bpm, oxygen saturation 87% on room air and temperature 36.8 °C. The patient was dehydrated and delirious. Chest auscultation disclosed diminished lung rums and diffuse mild wheezing. Chest X-ray (CXR) on admission showed diffuse hyper-inflated and hyper-lucent lungs with loss of vascular markings and flat hemidiaphragms; no areas of consolidation were evident. Laboratory analyses demonstrated normal white blood cell (WBC) count, blood glucose of 250 mg/dL, serum lactate of 11 mmol/L, serum creatinine 1.4 mg/dL and urea nitrogen (BUN) 68 mg/dL. Arterial blood gas showed an acute over chronic hypoxemic-hypercapnic respiratory failure with respiratory acidosis (pH 7.33, PaCO₂ 46 mm Hg, PaO₂ 41 mm Hg, HCO₃ 29 mmol/L on room air). The patient was subsequently admitted to the acute respiratory care ward and was started on non-invasive ventilation and ceftriaxone. Hypoxemia, hypercarbia, and the acid-base balance quickly recovered to normal values and delirium disappeared. Supportive therapy consisted of supplemental oxygen, intravenous fluid replacement, diabetes control optimization, prophylactic unfractionated heparin and a personalized diet. Respiratory, hemodynamic, and renal indexes were closely monitored. After 48 h the patient was mentally integer, left the NIV and started the respiratory rehabilitation. The pulmonary function

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* Corresponding author at: Geriatrics and Unit of Respiratory Pathophysiology, Campus Bio-Medico University and Teaching Hospital, Via A. Del Portillo 200, 00128 Rome, Italy. Tel.: +39 0622541653; fax: +39 0622541456.

E-mail address: r.antonelli@unicampus.it (R.A. Incalzi).

tests after a quick pharmacologic washout were successfully performed by a trained technician and revealed a severe fixed obstruction (FEV1/FVC ratio of 43% and FEV1 34% of predicted value after inhaled bronchodilator trial) associated with an increased air trapping (RV 138% of predicted). A geriatric multidimensional assessment was performed and a comprehensive home care program delivered. After discharge he was regularly assessed at home with regard to long term oxygen prescription and re-trained on how to correctly use inhalers and recognize early symptoms and signs of acute exacerbation. In the following six months the patient regained weight, had less dyspnea and improved physical limitation. He did not suffer any new acute exacerbation of COPD in the following six months.

This case report includes some of the most common features of COPD in the elderly. These features are the object of this review.

2. Is Chronic Obstructive Pulmonary Disease (COPD) an age-related chronic condition?

COPD is a typical disease of aging as its prevalence dramatically increases with age, ranging in the USA population from about 6.6% in the 45–54 year age group to about 12% in >64 age group [1]. Data pertaining to European countries refer to the adult or overall, but not to the geriatric population (Table 1) [2,3]. COPD accounts for most of the people on long-term oxygen therapy, that is on average a population aged over 70 years [4]. This finding likely reflects the effect of cumulative exposure to smoke and pollutants. Furthermore, telomere shortening, a distinctive sign of the aging process, characterizes COPD patients, and age and COPD additively promote it [5]. Interestingly, telomerase dysfunction and the accelerated telomere shortening are also common in endothelial cells involved in the atherosclerotic process, a prototypal age-related condition, as well as in immunologic diseases, such as rheumatoid arthritis, which are strictly related to age [6,7]. Thus, a clear-cut biological basis seems to underlie the epidemiological evidence, although the link between COPD and defective telomerase should be depurated of the effects of previous infections such as Cytomegalovirus infection [8].

Several other similarities between aging lung and COPD lung are worth noting: vital capacity declines by 10–20 mL yearly in normal aging [9], about 30 mL in COPD patients [10], whereas residual volume increases in both normally aging and COPD lung [11]. Furthermore elastic recoil, mucociliary clearance, mucosal immunity and vascular reserve decrease in the elderly and, more, in COPD [12].

Despite the strong link to age, COPD prevalence in the elderly is incompletely known. Indeed, both age-related changes in the clinical presentation of COPD and the confounding effect of comorbidity as well as several problems with the execution of spirometry contribute to hamper the diagnosis of COPD in the elderly population.

3. Why COPD is often so difficult to diagnose in the elderly population?

COPD is rarely presenting alone in elderly patients. Comorbidity and disability of various origins contribute to make the recognition of COPD problematic. Furthermore, cognitive impairment, mainly of verbal memory and constructive ability, and depression may dominate the clinical scene in subjects with hypoxemia and hypercapnia [13,14]. Even severe exacerbations of COPD can be recognized late due to atypical presentation. Indeed, at variance with the classical triad of dyspnea, cough and fever [15], muscle weakness, vertigo, confusion and leg edema, all reflecting severe hypoxemia, are the hallmark of atypical presentations [16], and occasionally delirium may be the main presenting feature. Age-related increase in the threshold of dyspnea and physical disability, frequently multifactorial in origin, variously contribute to make dyspnea a secondary feature of exacerbation in selected patients. Finally, chest pain may reflect right ventricular overload secondary to pulmonary hypertension or worsening myocardial ischemia by hypoxemia [16].

Disability of non-respiratory origin, e.g. orthopedic or neurologic, can restrain physical activity at a level well below the threshold for dyspnea, hampering the recognition of stable COPD in the elderly. As a consequence, experience and skill are required to suspect and, then, diagnose COPD in the elderly.

Spirometry plays a pivotal role in the diagnostic workup [17], but frail and disabled people may be unable to satisfactorily perform this test. Table 2 summarizes conditions more frequently accounting for a poor quality pulmonary function test [18]. These factors contribute to the “epidemic” underdiagnosis of COPD: about half of patients with COPD escape recognition [18]. Furthermore, the need of complying with spirometry criteria results in a biased selection of patients recognized as affected by COPD by automatically excluding the most frail. Indeed, subjects have to meet acceptability criteria of spirometry in at least three curves and, then, with repeatability criteria [19]. Table 3 displays the currently requested acceptability and reproducibility criteria, together with the corresponding technical

Table 1
COPD prevalence in selected European countries.

Country	COPD prevalence	Reference population	Data source	Year
Austria	4.6%	Adult population sample	Statistik Austria	2007
Belgium	5.3%	Middle-aged population	Ministry of Health. Health for all database	2004
Czech Republic	2.4%	Adult population	Institute of Health – Information and Statistics	2007
Finland	Over 5% have diagnosed COPD; a further 5% estimated to have concealed COPD	Total population	The National Finnish COPD Programme	2007
France	6% to 8%	Adult population	Ministère de la Santé et des Solidarités	2005
Germany	13.2%	Adult population	Geldmacher et al. (BOLD study) [2]	2008
Ireland	7.3%	Adult population	The Irish Thoracic Society	2008
Italy	4.5%	Total population	ISTAT	2007
Netherlands	2%	Estimated	National Institute for Public Health and the Environment	2006
Portugal	4.6%	Adult population	National Observatory of respiratory disease	2008
Serbia	6.0%	Adult population	Institute of Public Health of Belgrade	2007
United Kingdom	1.5% correctly diagnosed; 3.7 million (6%) estimated to be affected	Population over 40 years old	Stang et al. [3]	2000

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